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A STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

(FINAL REPORT)
for
SUPPLY AND SERVICES CANADA

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RE: STUDY OF ALKALI-REACTIVITY OF POTENTIAL
CONCRETE AGGREGATES OF NEW BRUNSWICK

Presented herein is our final report on this project. We would like to take this opportunity to acknowledge the contributions to this work by Dr. J.A. Soles, P.Eng., of the Scientific Authority, Dr. J. Gillott who carried out petrographic studies of hardened concrete, and Dr. T.W. Bremner who provided technical assistance and was instrumental in conducting early studies into this problem in New Brunswick.

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EXECUTIVE SUMMARY

Examination of concrete structures within the Province of New Brunswick has shown that a substantial proportion of Class A, B and C type exposures (subject to freeze-thaw in the presence of moisture) have evidence of damage due to alkali reactivity. This is a reaction which occurs between certain components in some concrete aggregates and alkali in the cement.

Visual evidence of alkali reactivity has been confirmed by petrographic studies of samples from affected concretes.

Detailed petrographic studies of current New Brunswick aggregate sources have shown that from 40 to 100 percent of the rock types occurring within individual aggregate sources are similar to those which have been found to be deleteriously reactive in other jurisdictions. The major types of potentially deleterious aggregates are greywackes and argillites which are most predominant in the south and north western parts of the Province.

Petrographic study of concrete from affected structures indicates that greywackes and argillites are two of the primary rock types involved in alkali-aggregate reaction and deterioration.

Geographically, the most severe damage to structures coincides with the predominance of greywackes and argillites in the natural gravel deposits. The composition of the natural gravels is closely related to the bedrock geology, indicating limited transport of these materials.

Standard engineering tests have confirmed that certain greywackes, argillites, schists, limestones and natural gravels found in New Brunswick are reactive. The degree of reactivity ranges from marginal through moderate to extreme. The greywackes and impure limestones are the most reactive rock types encountered.

The geographical distribution of reactive rock types from the engineering test program is similar to that of the most severely deteriorated structures, i.e., the south and north western portions of the Province.

The alkali-aggregate reaction occurring in New Brunswick is a very slow alkali silicate type. Field evidence of reaction usually takes 8-10 years to occur and substantial damage may require 20-30 years or more. Engineering test results may require six months to one year to evaluate.

The test results indicate that the reactions are sensitive to temperature and alkali content of the concrete. Expansions increase with increases in temperature and with increases in alkali content. Because of these characteristics, the current CSA accelerated prism test appears to be the most positive indication of potential reactivity.

There is a body of evidence that the current accelerated test may not be severe enough to always positively identify deleterious reactive aggregates such as occur in New Brunswick, and that higher test cement contents may be warranted.

It has not been possible to distinguish features of reactive and non-reactive rocks within the same rock type which would allow identification of reactive types without long term testing. Further work is warranted in this area.

Due to the prominence of potentially reactive rock types in the Province, work on mitigative measures such as use of fly ash, silicafume, slags, low alkali cements, etc., to minimize deleterious reactions is warranted.

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1.0 INTRODUCTION

Concrete durability is a problem of economic significance on a worldwide basis. A recent study on concrete durability in the United States by the National Materials Advisory Board of the National Research Council (1) estimated the value of the concrete infrastructure in the U.S. at six trillion dollars, with current replacement and repair requirements due in large part to durability problems estimated at several hundred billion dollars.

One cause of poor concrete durability is alkali reactivity. Alkali reactivity of concrete aggregates resulting in deleterious premature deterioration of concrete structures was first identified in the 1940s. The various types of reaction and mechanisms are discussed in Section 3.0. Basically, however, alkali reactivity is a reaction between the aggregate materials and alkalis in portland cement concrete. The reaction and/or its products cause expansion of the concrete and associated cracking.

In recent years there has been increased interest in this problem as more evidence of distress attributed to reactive aggregates has been found on a world scale. The Seventh International Conference on Alkali-Aggregate Reactions which was held in 1986 in Ottawa and was attended by over two hundred delegates from twenty-three countries, attests to widespread interest in the subject.

Concrete structures in southern New Brunswick are known, in some cases, to have deteriorated more rapidly than those in other areas of the Province. Many structures built during the last 50 years show signs of surface map cracking, popouts, efforescence, extrusion of joint filling materials and closure and spalling at expansion joints. Over the years a number of studies have identified one of the probable causes of premature concrete deterioration in southern New Brunswick as alkali-aggregate reaction. The results of previous studies are summarized in Section 2.0.

In 1985 CANMET sponsored a major investigation of the problem through the Mineral Development Agreement with the Province of New Brunswick.

The basic terms of reference of the investigation were as follows:

> "to determine the potential reactivity of possible New Brunswick aggregate materials when they are implaced in portland cement concrete - to provide necessary information on the stability of aggregate materials identified by the Province, to guide their use in potentially destructive environments."

ADI Limited was awarded the contract to carry out the work which was begun in October 1985.

The basic tasks involved in the study were:

- A review of existing studies and owner contacts.

- A review of the alkali-aggregate reactivity literature.

- Site visits to examine concrete structures throughout the Province to select representative concretes of varying ages and conditions for sampling and petrographic study.

- Review of provincial geology, sampling and petrographic studies of existing and potential aggregate sources to evaluate the aggregate types present and their distribution throughout the Province.

- Test programme to evaluate typical rock types found in Provincial aggregates together with a selection of natural aggregates representative of those found in the Province.

These tasks are discussed in the following sections.

2.0 EXISTING STUDIES AND OWNER CONTACTS

2.1 Canadian Experience

Concrete deterioration due to alkali-aggregate reactivity has been reported from nearly all major geographic regions of Canada.

The Canadian experience with reactive aggregates has been summarized by P. E. Grattan-Bellew (2) and Dr. J. Gillott (3). The first case was recorded in Ontario approximately 30 years ago. Since that time, occurrences of concrete distress due to reactive aggregates have been noted in Nova Scotia, New Brunswick, the St. Lawrence Lowlands and Montreal area, Kingston, the Canadian Shield, Canadian Arctic and the Prairie Provinces. No recorded cases had been noted in British Columbia; however, this has been attributed to extensive use of low alkali cement since some potentially reactive aggregates have been identified in that Province.

2.2 New Brunswick Experience

The first recorded indication of concrete deterioration due to alkali-aggregate reaction in New Brunswick was made by Swenson et al (4) in 1969-70. During a comprehensive study begun in 1963 into alkali-expansivity of concretes in the Province of Nova Scotia, the researchers also visited a number of structures in the adjoining portion of New Brunswick and identified from visual examination a number of concrete structures which they regarded as suffering from alkali-expansivity. These structures, some nine in number, were located along the lower Saint John River, in the Sussex area, and along the lower Petitcodiac River.

Their work included a condition survey of some 200 structures of which they classified 45 percent as showing definite evidence of deleterious reaction. Samples were obtained from these structures to evaluate the rock types present in the aggregate. From a study of these results together with a detailed programme of laboratory testing, it was determined that rock types including greywackes, argillites, phyllites, some quartzites, schists and rhyolites were reactive with alkalis in portland cement concrete. A more limited test programme indicated that pozzolans such as fly ash could be effective in minimizing the reactions. Some modifications to existing test methods were proposed to assist in identification of reactive aggregates. These generally took the form of accelerating mortar bar and prism expansion tests through use of higher temperatures or increased alkali contents or a combination of both.

Haines (5) in 1974 carried out a review of the Nova Scotia work as it related to New Brunswick as well as conducting standard prism tests on three New Brunswick aggregates. He found excessive expansions in the order of 0.08 percent at ninety-eight days for the aggregates tested (tests were run at one percent equivalent alkalis, 60°±5°F).

In 1980 Cox (6) carried out an extensive field survey of concrete structures in the Sussex-Saint John area of southern and southeastern New Brunswick. He examined a total of 122 structures of which thirty-four percent were considered as definitely showing evidence of alkali-reactivity. An additional thirteen percent were considered as showing traces of reaction. These percentages are similar to those found in the earlier Nova Scotia study. Cox also carried out prism expansion tests on aggregate from the Sussex and Saint John areas. His tests were of limited duration (3 months) but did show substantial differences in the behaviour of the two aggregates. The Sussex materials expansion was negligible whereas the Saint John material, at 0.02 percent, would have been considered of marginal acceptance for severe exposure conditions.

Dr. J. Soles of CANMET (7) examined petrographically five samples from concrete structures which had been examined by Cox. He identified three of them as containing aggregate materials which were unstable in their environment. A long-term alkali-silicate reaction was suspected as part of the cause of distress. The aggregates types whose performance was questioned were phyllites, greywackes, cherty to carbonatic meta sediments and meta volcanics. These are all rock types similar to those found to be reactive in the Nova Scotia study.

Kierstead (8) in 1984 reviewed the structures which Cox had examined. He noted increased evidence of distress in the intervening four years. He traced the source of aggregates in at least one of the Sussex structures suffering from reaction to the Saint John area. He also carried out prism expansion tests on three Saint John Aggregate sources. His tests were of very short duration, 28 days. Two aggregates showed very little evidence of expansion, while the third showed some indication of expansion.

A NCHRP report (9) on the durability of concretes containing high range water reducing admixtures published in 1987 found evidence of alkali-reactivity in a concrete sample from a bridge deck overlay near Fredericton, N.B. placed in 1979. "Microcrystalline quartz within shale coarse aggregate particles" was identified as the cause and it was noted that "many of the coarse aggregate particles were cracked, especially at depth removed from the surface".

In addition to the work noted above, there have been studies of various aggregate sources carried out by private companies, the New Brunswick Electric Power Commission and the Department of Transportation. The results of such studies have, for the most part, remained unpublished.

2.3 Owner Contacts

As part of this study questionnaires were mailed to various organizations within the Province to determine what, if any, evidence of alkali-reactivity had been experienced. Among those surveyed were:

Major cities
Major utilities (NB Tel and NB Power)
CN and CP Railways
N.B. Department of Transportation
Public Works Canada
Ports Canada
Portland Cement Association
Atlantic Provinces Ready-Mix Association
Major industries such as pulp & paper
Major consulting engineering firms.

In general, the replies received indicated that performance of concrete within the Province was generally satisfactory. There were, however, indications that some older dams owned by municipalities and utilities could be experiencing aggregate reactivity. In addition, response from both railways indicated that durability problems were being experienced with concrete structures, the causes of which had not been positively identified. The New Brunswick Department of Transportation indicated that they were experiencing some concrete durability problems and attributed these to several causes such as freeze thaw, chloride attack, etc. The major utilities also indicated durability problems with concrete foundations for transmission towers, microwave towers, etc., but attributed the damage mainly to freeze thaw action.

3.0 LITERATURE REVIEW

3.1 General

As noted in the introduction, there has been increasing awareness of alkali-aggregate reactivity in recent years, both in Canada and on a worldwide basis. This has resulted in increasing research into the physical and chemical processes involved in the reaction, development of test methods for evaluation of aggregates and investigation into mitigative measures to reduce the risk of premature concrete deterioration due to alkali reactivity. A recent bibliography on alkali aggregate reactions in Canada by Rodgers (10) lists 110 references to Canadian research publications on alkali reactivity. Since the first case was diagnosed in Canada in 1956, literally several hundred instances have been found in Ontario, Quebec and the Maritimes. The discovery that alkali reactivity is more widespread than formerly believed can be attributed to a number of factors including:

- an increasing awareness in the technical and scientific community of the problem and of diagnostic tools with which to evaluate it;

- a general increase in alkali levels in cements due to environmental and economic considerations;

- a large stock of concrete structures built within the past thirty to forty years;

- increased pressure on aggregate resources;

- general use of higher cement contents;
- widespread use of deicing salts which may accelerate the deterioration through several mechanisms.

3.2 Alkali-Aggregate Reactions

Alkali-aggregate reactions are chemical reactions between aggregates and alkalis in portland cement concrete which give rise to deterioration of the concrete through excessive expansion and cracking. The actual expansion of the concrete may not be of concern unless sufficient to impair the use of the structure (e.g., through misalignment of equipment, buckling of members, etc.). Cracking of concrete, however, is undesirable for many reasons. It has implications on strength of members. It also greatly increases permeability and therefore access of moisture and contaminants to the concrete and reinforcing steel. This can lead to accelerated deterioration from freeze-thaw, corrosion and leaching, all of which may cause more damage than the original cracking. In general, there are three basic requirements necessary for alkali-aggregate reactions to occur: sufficient available alkalis in the concrete, reactive aggregates, and sufficient humidity, generally in the order of 80-85 percent RH or greater.

At one time it was thought that the only source of alkalis was from the cements used. Additional research (14), however, has indicated that alkalis may be available from sources outside the concrete such as deicing salts and sea water.

As indicated in Section 3.3., a greater number of rock types are being found to be reactive as more study and research is directed to address this problem and as more cases of reaction are diagnosed in the field.

Studies into moisture conditions of field concretes revealed that the internal relative humidity of mass concretes and slabs-on-grade were normally high enough to allow reactions to proceed, even in arid climates.

Although some forms of these reactions have been known since the 1940s, additional types of reactions have been found more recently, and the actual physical and chemical processes of some of these reactions are still not completely understood. The current CSA CAN3-A.23.1-M77 code identifies three basic types of reaction found in Canada.

3.2.1 Alkali-Silica Reaction

The original type of alkali-aggregate reaction identified is known as an alkali-silica reaction, sometimes referred to as the "classical" form. The recent ACI Guide to the Selection and Use of Hydraulic Cements (11) indicates that this form of reaction results from the presence of concentrated alkali hydroxide solutions in the pore spaces of the concrete. These are generated by the interaction of minor amounts of potassium or sodium, or both, in the cement, usually in the form of sulfates, with the liquid phase in hydrating cement. As a result of the removal of calcium and sulfate ions as ettringite forms, sodium and potassium cations and hydroxide ions accumulate in the liquid phase. The increased pH leads to attack on reactive aggregates. The accumulation of hydroxide ions and the consequent high alkalinity brings about the reaction with the reactive aggregates. Depending on the hydroxide ion concentration, the presence and proportion of reactive aggregate particles and their physical characteristics, the water-cement ratio and cement content of the concrete; the product of the alkali-silica reaction may be a hydrous calcium alkali-silica gel that is expansive to a limited degree or a hydrous alkali-silica gel that may imbibe water, causing much more expansion and associated disruption of concrete. As indicated by the name, the reactive component of the aggregate is silica, generally in microcrystalline, cryptocrystalline or amorphous form and glassy acid to intermediate volcanic rocks.

The principal cause of expansion is attributed to the formation of the expansive gel. Cracking of concrete structures in the field which are undergoing alkali-silica reactions generally occurs within ten years of construction.

3.2.2 Alkali-Silicate Reaction

This form of reaction was identified in the late 1950 to early 1960s period and was originally considered to be similar to the alkali-silica reaction. In the more recent 1986 supplement No. 2 to the CSA CAN3-A23.1-M77 code, the terminology Slow/Late-Expanding Alkali-Silicate/Silica Reaction has been adopted. This form of reaction is distinguished by a very slow rate of expansion such that cracking in field structures may not be evident for twenty to thirty or even fifty years (11). The mechanisms of the reaction are not well understood. The amount of expansive gel is generally less than the classical alkali-silica reaction produces. There appears, however, to be an actual increase in the physical size of the affected aggregate particles which may be responsible for much of the expansion and disruption. Gillott et al. (12) have indicated that the mechanism may be destruction of interlayer precipitates in the aggregate by alkaline solutions, thus allowing water access to clay minerals which then swell, producing disruptive expansions. A wide variety of sedimentary rock types and their metamorphic equivalents have been implicated. More recently, during the 1970s, strained quartz has been associated with this type of reaction, although other types of quartz such as the microcrystalline form may be responsible as well (12).

3.2.3 Alkali-Carbonate Reaction

A third type of alkali-aggregate reaction is the alkali-carbonate reaction first recognized in Canada in 1957 (13). This reaction occurs with certain dolomitic limestones containing argillaceous or clay minerals. Again, the physical and chemical processes resulting from the reaction are not well understood; however, the expansion of the coarse aggregate particles provide the disruptive forces to the concrete. The reaction process is relatively rapid, and evidence in field structures is generally found within a few years of construction.

3.3 Potentially Reactive Aggregates

Thirty years of investigation and research in Canada has shown that concrete deterioration due to alkali aggregate reactions has been linked to a fairly wide variety of rock types.

Table 3.1 shows those rock types currently indicated as being potentially deleterious in the 1986 CSA A23.1 and 2. For comparative purposes, Table 3.1 also shows rock types considered potentially deleterious in other jurisdictions.

Those rock types listed under group one are those associated with the classical alkali-silica reaction; group two rocks are associated with the slow, late expanding alkali silicate/silica reaction and group three with carbonate reactions.

Some indication of the amount of reactive materials which may give rise to reactivity is indicated in the table.

Some materials give rise to a pessimum effect, that is the amount of reaction is greatest at a certain percentage of the reactive aggregate and decreases when either higher or lower

TABLE 3.1

POTENTIALLY DELETERIOUS ROCK TYPES

Canadian Experience CSA CAN3-A23.1-M77 1986 Rev. 2, Ref.(40)	Corps of Engineers Experience Ref (15)	United Kingdom Experience Ref (16)
GROUP 1		
- Poorly crystalline silica; cryptocrystalline, opal, chert, flint, chalcedony, secondary quartz overgrowths, tridymite, cristrobalite, volcanic glasses, manufactured glass. Amounts as small as 1 to 5 percent may cause reactions.	Any opal; more than 5 percent chert in which chalcedony is present; more than 3 percent glassy igneous with any acid or intermediate glass, more than 1 percent tridymite or cristobalite; more than 20 percent strained quartz (UAE greater than 15 deg.) greywackes, argillites, phyllites, siltstones, etc.	Microcrystalline and cryptocrystalline silica and chalcedony, flints, cherts, strained quartz (reactive silica content greater than 0.4 percent of mass of aggregate may result in reactions).
GROUP 2		
- Strained quartz and quartz bearing rocks: greywackes, quartz-arenites, quartzites, hornfels, quartz biotite gneiss, granite, phyllite, arkose and sandstone. Amounts in excess of 15 percent.		
GROUP 3		
- Argillaceous dolomitic limestones.		

percentages are used. This effect is most frequently found with the opals, cherts and other reactive silica minerals, volcanic glasses, etc., which show maximum reaction at about five to twenty percent levels of these materials.

Because only very small percentages of the aggregates are reactive in the slow, late expanding rock types, there is generally no pessimum effect, and the carbonate reactive rocks are similar (22).

It is of interest to trace, historically, the knowledge of aggregates involved in alkali-aggregate reactions. In Canada this information is best documented in various editions of the CSA A23.1 code or its predecessors. Table 3.2 illustrates the various rock types which have been considered potentially deleterious over the years. The first mention of the problem was in the 1960 code, which is not surprising in view of the fact that the first documented case of aggregate reactivity in Canada occurred in 1957 (10). The rocks indicated in the 1960 edition of CSA A23.1 were primarily those involved in the alkali silica or so called classical type reaction, with the exception of certain dolomitic limestones which had been first identified in Canada in the late 1950s (17). These rock types remained unchanged in the 1967 code revision. In 1973, however, additional siliceous rocks including greywackes, argillites, schists, quartzites and siliceous shale stones were included as potentially deleterious as well. This was largely due to work in Ontario and Nova Scotia. The 1977 CSA code included no additional potentially deleterious aggregate types. The 1986 revisions, however, included the warning that strained quartz was thought to be responsible for aggregate reactions and indicated an additional listing of rocks which may contain strained quartz including quartzwackes, quartz arenites, hornfels, quartz biotite gneiss, granite, arkose and sandstone.

TABLE 3.2

HISTORICAL REVIEW OF POTENTIALLY DELETERIOUS ROCK TYPES

CSA Concrete Code Edition	Rock Types Described as Potentially Deleterious
1948	No mention.
1960	- silica in the form of opal, chalcedony, tridymite, and cristobalite; - intermediate to acid volcanic glass such as likely to occur in rhyolite, andesite, or dacite. - certain zeolites such as heulandite. - certain constituents of some phyllites. - certain dolomitic limestones.
1967	- Same as for 1960.
1973	As above with the addition of certain siliceous rocks such as greywackes, argillites, schists and quartzites from the Appalachians and Canadian Shield as well as siliceous shalestones found in some Prairie sands and gravels.
1977	Same as for 1973.
1986 Revision	As for 1973 with the addition of strained quartz - includes a wide variety of quartz bearing rocks, quartzwackes, quartz arenites, hornfels, quartz biotite gneiss, granite, arkose and sandstone.

In general, most of the rocks identified as potentially deleterious in the 1973 and later codes are those which are associated with the slow expanding silicate/silica reactions. The extreme slowness of concrete deterioration due to alkali reactivity of these aggregates is in large part responsible for the relatively recent realization that such rock types are reactive.

It is significant that, as discussed in Section 5, relatively large percentages of the natural gravels in New Brunswick are composed of argillites, greywackes and other rock types which have often been associated with slow, late expanding alkali-aggregate reactions.

3.4 Test Methods for Alkali-Reactive Aggregates

Various test methods for evaluation of the potential reactivity of concrete aggregates have been developed since 1950. A comprehensive review by Grattan-Bellew is given in Reference 18. In general, there are five basic types of tests: petrographic, chemical, tests on mortars, tests on concretes and tests on rock materials themselves.

3.4.1 Petrographic Tests

The basic petrographic test is described in ASTM C295, Petrographic Examination of Aggregates for Concrete. This test is used to classify and quantify the various constituents of an aggregate and thus forms a basis to evaluate, by comparison with past performance, if an aggregate is likely to be reactive or nonreactive. As such it is an indirect test and if a reactive aggregate is indicated on the basis of petrography, additional physical testing is usually warranted. The test is also useful in determining which physical or chemical tests are appropriate to use in further evaluation of various rock types.

3.4.2 Chemical Test

A chemical test, ASTM C289, was developed in the early 1950s for use in identifying alkali-silica reactive aggregates. The test is relatively rapid but has a poor record in indicating reactivity, especially of the slow expanding rock types (18). It is not suitable for use with carbonate type rocks.

3.4.3 Mortar Tests

This standard test, ASTM C227, was developed in the early 1950s, again as an aid in identifying alkali-silica reactive aggregates. The mortar bar test consists of fabrication of a cement-sand mortar bar 25 x 25 x 250 mm in dimension. The sand is obtained by crushing coarse aggregate or using natural sand, depending on the aggregate under test. Specimens are stored at 38°C and 100 percent relative humidity and expansions are measured over time. The accepted criteria are 0.05 percent expansion at three months or 0.10 percent at six months. Attempts to use this test to identify slowly expansive rocks and alkali carbonate rocks have been less successful. Numerous investigators have shown examples of slowly expansive aggregates, which are known to cause unacceptable deterioration in the field, but pass the generally accepted limits for the test (11, 15, 18, 19). Current CSA limits are given in Table 3.3

There are a number of reasons for the lack of correlation between mortar bar test results and field performance, some of which are discussed below:

> If a portion of the deleterious expansion is caused by actual expansion of the aggregate particles as is believed to occur with the carbonate type reactions and the slowly expanding rocks, then crushing of these aggregates to sand size to manufacture mortar bars may actually result in a reduction in expansion of the aggregate particles.

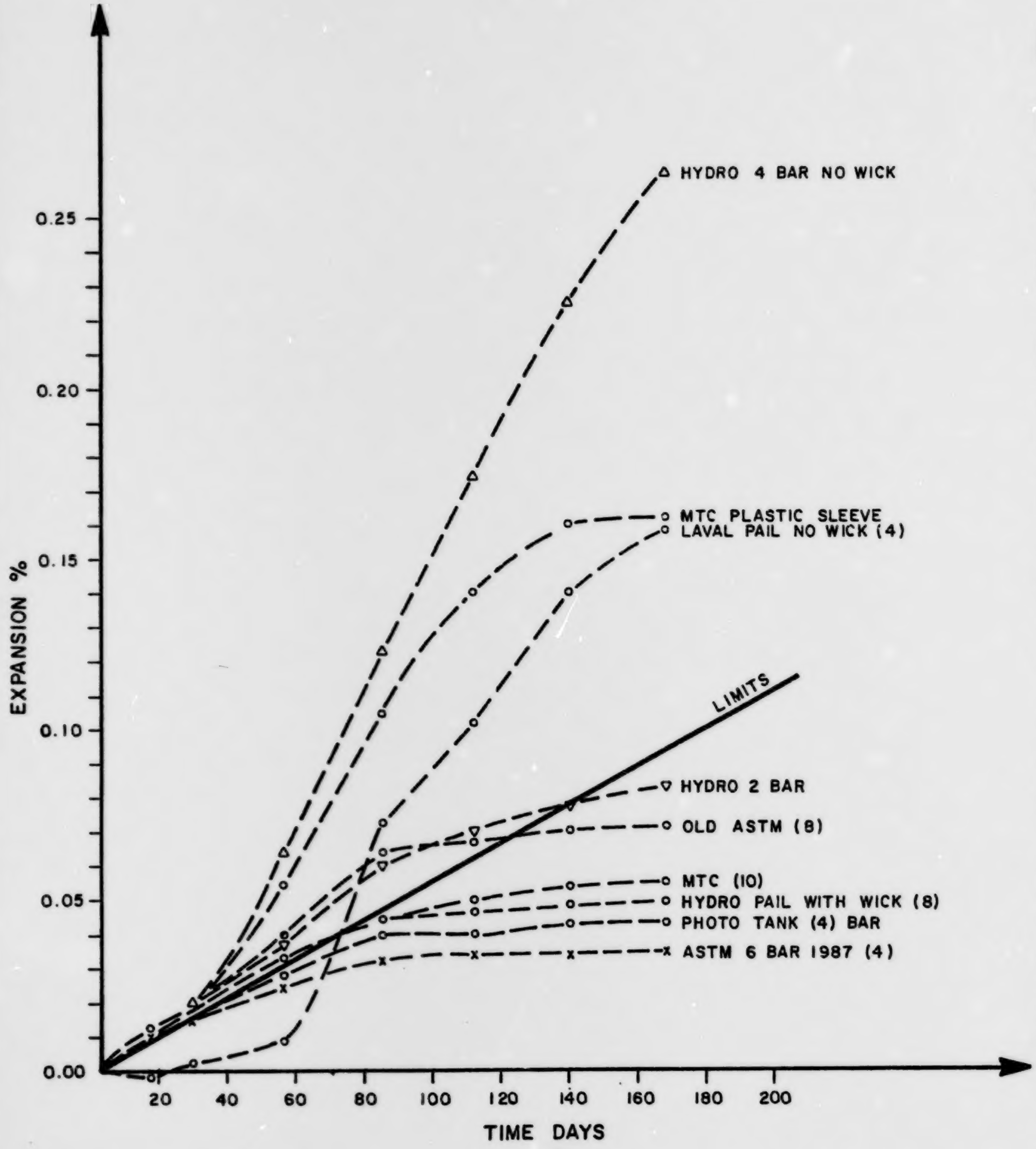
The criteria used as an acceptable limit is known to be inapplicable to late expansive type aggregates and strained quartz (11, 15) which may not begin to expand for three months but may continue longer than six months.

It has become apparent that the test conditions can significantly alter test results. Hooton (20) has shown that mortar bar container effects can result in expansions varying by about a factor of three, when pyrex was used as the aggregate under test.

Ref. (19) indicates significant differences in test results among various international laboratories participating in an interlaboratory study on the same, known reactive rock material.

Figure 3.1, based on information provided by the Department of Transportation and Communication, Province of Ontario, shows an extremely wide range of expansions measured on samples of the same control aggregate being tested in different containers. It should be noted that known reactive material tested in six of these containers met the current ASTM and CSA limits for expansion at six months.

It is believed that the cause of some of these discrepancies is leaching of the alkalis from the relatively small mortar bars during the test; thereby stopping the reaction.



COMPARATIVE EXPANSIONS MORTAR BARS (ASTM C227) WITH VARIOUS TYPES OF CONTAINERS
SOURCE: REACTIVE SPRATT AGGREGATE
COURTESY ONTARIO MTC

ADI
ADI Limited
Engineering, Architecture, Planning
Management Consulting, Surveying
(506) 452-9000
Suite 407, 1133 Regent Street
Fredericton, NB Canada

Project		
1264 - 30		
Dwg. FIGURE 3.1		
Drn. By	Scale	Date
P.R.C.	—	02/88

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Regardless of the causes, results such as discussed above are grounds for considerable concern among investigators and practicing engineers. The necessity for conducting comparative tests on aggregates of known performance is apparent.

3.4.4 Concrete Tests

Canada has been in the forefront of development of expansion tests on actual specimens of concrete. These tests are conducted on concrete prisms from 75 to 120 mm square and 350-450 mm long. Originally used as a basis for evaluating alkali carbonate reactive aggregates, an accelerated version has recently been introduced in the 1986 CSA A23.1-A23.2 revisions. The original tests utilized storage of specimens at 23°C. The accelerated test requires increased alkali levels (1.25 percent Na_2O equivalent) and storage at 38°C. A cement content of 310 kg/m^3 is specified for the test; however, provision is made to evaluate job mixes with a higher cement content. The current CSA suggested expansion limits are given in Table 3.3.

TABLE 3.3

SUGGESTED MAXIMUM EXPANSION VALUES FOR VARIOUS TEST METHODS FOR ALKALI-AGGREGATE REACTIVITY

Exposure Class (A23.1-M77, Table 7)	Concrete Prism Expansion Test (A23.2-14A)	Mortar Bar Expansion Test (ASTM C227)	Accelerated Concrete Prism Expansion Test (A23.2-14A, Clause 2.5)
A, B, C	0.01% at 3 months* 0.025% at 1 year	0.05% at 3 months+ 0.10% at 6 months++	0.04% at 1 year
D	0.04% at any age (1 year)	0.05% at 3 months 0.10% at 6 months	0.075% at 1 year

Notes:

* In critical structures such as those used for nuclear containment, a maximum expansion limit of 0.02% at one year is recommended.

+ As in the above note except that the limits are 0.05% at six months and 0.10% at one year.

++ It is recommended that, when used to evaluate carbonate rocks containing chert, the alkali content of the cement used to make the mortar bars be increased to 1.25% by the addition of alkali to the mix water. This is necessary because some limestones containing finely divided chert and assessed as acceptable on the basis of the mortar bar test results, ASTM C227, caused deterioration in field concretes.

The results of a recent interlaboratory study on carbonate rocks (21) has shown that considerable variations can occur due to test procedures. The results are summarized in Table 3.4.

TABLE 3.4

SUMMARY OF INTERLABORATORY TESTS ON CARBONATE AGGREGATE

Aggregate	No. of Labs	Comments	Results
nonreactive	12	mixes by individual labs	2 failed 1 marginal
medium reactive	12	mixes by individual labs	1 passed 3 marginal expansion range 4.8*
highly reactive	12	mixes by individual labs	all failed range 4.9
medium reactive	12	same cement, fine agg, mix proportions	1 passed range 2.5
nonreactive	8	all prisms made by one lab	1 failed range 5.3
medium reactive	8	all prisms made by one lab	2 passed 1 marginal range 2.2
highly reactive	8	all prisms made by one lab	all failed range 2.5

Notes:

passed - indicated specimens did not exceed allowable expansions (0.025% 1 year)

*range - largest expansion at one year divided by smallest expansion at one year

These data indicate the necessity of using an aggregate of known performance for comparative purposes during test programmes.

3.4.5 Rock Cylinder Tests

This test, carried out on the rock material itself, was developed to evaluate carbonate rocks. It consists of immersing a small cylinder of rock in 1N NaOH at room temperature and measuring the expansion over time. Expansions of 0.1 percent and 0.2 percent at four and sixteen weeks respectively usually indicate deleterious aggregate. This test cannot be used for aggregates which are alkali-silica reactive. It has been used to evaluate some types of slow expanding rocks. These are generally stored at 38°C. There is evidence that expansions may be affected by the orientation of the sample with respect to the rock foliation or bedding.

3.4.6 New Test Approaches

A number of modifications in test methods have been advanced by various investigators. These include modifications to existing test methods and development of alternate methods.

The most common modifications have been associated with the mortar bar test (ASTM C227). The Corps of Engineers (15) currently use an accelerated form of the test for strained quartz. Mortar bars in which five coarse particles of strained quartz are embedded are run at an elevated temperature of 60°C. Allowable expansion limits are set at 0.04 percent at one year.

The Oberholster test proposed for siliceous materials uses mortar bars immersed in 1N NaOH stored at 80°C. Allowable expansion is 0.1 percent at 10 days.

Numerous other investigators have proposed variations on an accelerated mortar bar test (24). Knudsen has proposed a chemical shrinkage test, which measures the shrinkage when reactive sand is immersed in 10 molar NaOH at 50°C (25).

Berard (26) has proposed a modification of the current ASTM Chemical Test C289, in which the test is performed on the insoluble residue after treatment of the aggregate with HCL, a procedure which allows the test to be used on carbonate rocks.

The Portland Cement Association are developing an osmotic pressure test to identify reactive aggregates in thirty days (31).

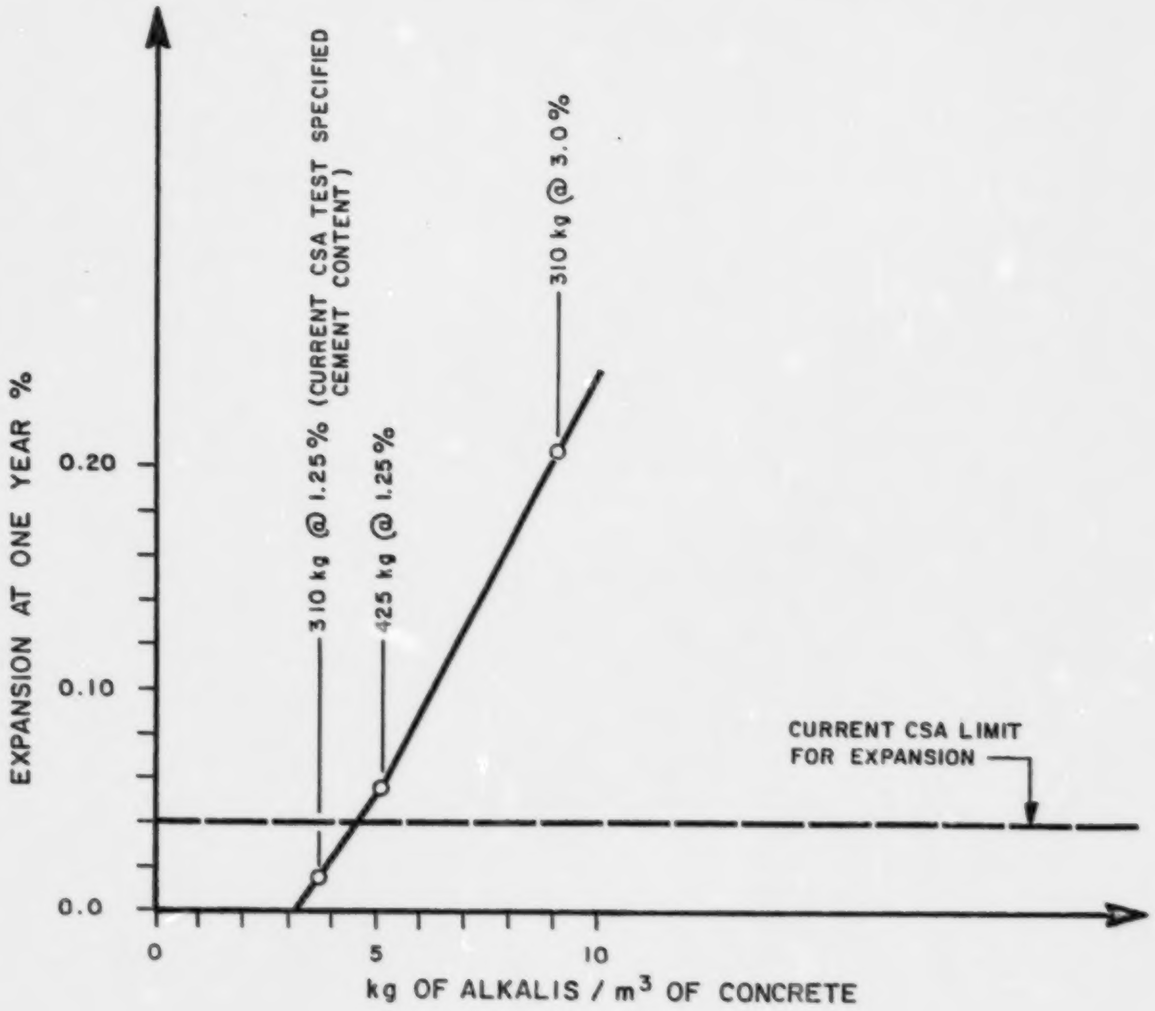
Other investigators have proposed various methods of wet and dry cycling tests as a measure of expansivity.

3.5 Other Factors Which Influence Reactions

Factors other than aggregates influence reactivity. One of the most important is the alkali content of the concrete or the availability of external sources of alkalis.

The principal source of alkali is the cement used in concrete manufacture; however, alkalis may also be derived from the aggregates (26, 14), from mineral admixtures (27), deicing agents and mixing waters (26).

The total amount of alkali available is now thought to be the critical factor. For many years it was believed that using cements with alkali contents below 0.6 percent was sufficient to prevent problems with reactive aggregates. More recently, cases have been found where use of low alkali cement has not prevented damage (11, 14). The total alkali available is the product of the alkali content of the cement times the amount of cement used. The practise in Great Britain (16) and some other jurisdictions is now to limit the total alkali content of the concrete from all sources if known reactive aggregates are to be used. Figure 3.2 shows the effect of increasing the total alkalis on one year expansion under current CSA accelerated



EXPANSION OF KNOWN REACTIVE AGGREGATE - CONCRETE PRISMS STORED AT 38°C VERSUS ALKALI CONTENT

SOURCE: SUDBURY AGGREGATE FIGURE COURTESY ONTARIO MTC

ADI Limited
Engineering, Architecture, Planning, Management Consulting, Surveying
(506) 452-9000
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Fredericton, NB Canada

Project 1264 - 30
Dwg. FIGURE 3.2
Drn. By P.R.C.
Scale —
Date 02/88

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prism test conditions for the known reactive Sudbury gravel from Ontario. This material has many similarities, petrographically, to New Brunswick gravels.

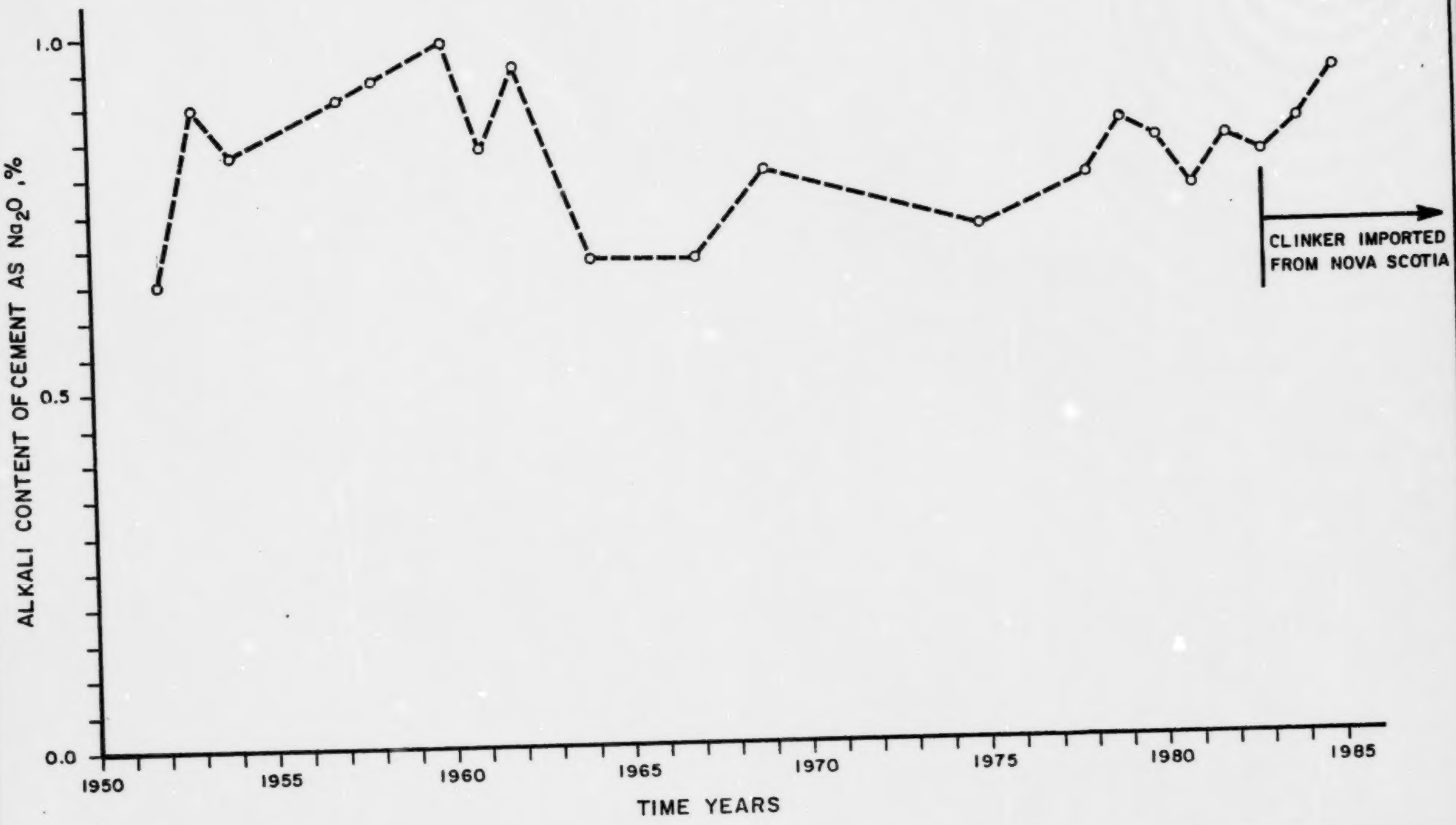
In testing carried out by Canada Cement Lafarge for CANMET with cements of various composition, it was found that the alkali content was the only factor having a significant effect on a known expansive aggregate (28).

Krell (29), however, indicated that test expansions increased with increasing fineness of the cement because finer cements give faster set, thereby reducing the time available for harmless reaction during the plastic state of the concrete.

Alkali contents of New Brunswick produced cements for the period 1952-1985 are given in Figure 3.3. In general the alkali content decreased in the early 1960s, then in about 1975 began to increase to its present level of approximately one percent. This trend has been worldwide due partly to environmental requirements and partly to economics of cement manufacture.

In 1975 the alkali contents from twenty-three Canadian plants ranged from 0.16 to 1.18 percent (30). New Brunswick production was seventh from the lowest at 0.74 percent.

An equally important factor in aggregate reaction is humidity. Many investigators have shown that the internal relative humidity of the concrete must be in excess of 80-85 percent for reactions to occur. Studies have also revealed that internal relative humidities of slabs-on-grade and mass concretes were normally 95 percent or greater even in arid climates, and that residual mix water may be sufficient for expansion to occur (14, 31).



ALKALI CONTENT OF CEMENT - PLANT Nº 2

HAVELOCK , NEW BRUNSWICK

COURTESY OF CANADA CEMENT LaFARGE

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Management Consulting. Surveying
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Suite 407, 1133 Regent Street
Fredericton, NB Canada

Project 1264 - 30		
Dwg. FIGURE 3.3		
Drn. By P.R.C	Scale —	Date 02/88

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Investigations into the effect of the actual water cement ratio on reactions have given variable results. Grattan-Bellew (22) indicates that increasing the water cement ratio dilutes the alkaline pore solution thereby causing the reaction to occur more slowly. Krell (29) on the other hand, has presented results which show higher water cement ratios increased expansion in test specimens. He postulated that a low water cement ratio decreased permeability thereby restricting movement of alkalis internally, and the higher concentration solution results in more rapid reaction when the concrete is still plastic.

Temperature plays a role in the rate of reaction and this fact forms the basis for most of the accelerated test methods. Various investigators have shown that expansions of mortar bars are maximized at temperatures of about 80°C (23).

Work on gels (32) has indicated that their expansivity is related to confining pressure. Research on concretes has shown that confinement of reactive concretes can reduce damage, and it is well known that the orientation of cracking due to aggregate reactions can be altered by reinforcing placement or prestressing effects.

A recent paper (33) has indicated that cathodic protection may accelerate alkali-aggregate reactions due to concentration of alkalis at the steel and that the rate of chemical reaction itself is accelerated.

Various investigators have shown that some admixtures have an effect on expansion of test specimens. Gillott (34) showed increases in expansion with sulphonated napthalene formaldehyde and decreases with lignosulphonate. Okada (35) presented results showing reductions in expansion with vinsolresin and carboxylic acids whereas napthalene types showed no significant impact.

3.6 Mitigative Measures

When known reactive aggregates are to be used for concrete manufacture, a number of mitigative measures have been used to prevent deleterious reactions. Of course, one obvious method is to avoid or remove deleterious rock types. However, in practice the beneficiation of aggregates to remove reactive rock types is, in many cases, not practical.

The original mitigative measure developed to prevent aggregate reactions was use of low alkali cement. This was defined as a cement with total alkalis expressed as Na_2O, of less than 0.6 percent. A few instances of reaction occurring at this level have occurred (11, 14). As noted previously, recent trends appear to be toward limiting the total amount of alkalis in the concrete as a measure of preventing reactions.

A second method of preventing reactions has been to use a pozzolan. Probably the most frequently used has been fly ash. Fly ash apparently fixes the alkalis in a stable crystalline compound (36) thereby reducing the available soluble alkalis. It also reduces permeability thus limiting moisture and alkali migration and concentration. Other investigators have shown that the available alkalis in fly ash can contribute to the reaction process (37), so that too low a dosage may actually increase expansion, at least in test specimens. CANMET (38) found similar results in a major study of typical Canadian reactive aggregates. Gillott found that 20 to 40 percent replacement of cement was required with typical Canadian fly ashes to limit expansion of test mortar bars (39). It is therefore necessary to test the proposed fly ash and aggregate combination to be used in order to ascertain its effectiveness in limiting reactions. Fly ash is not effective in mitigating against alkali carbonate type reactions (34, 40).

Silica fume has been studied as an agent to suppress reactions. Gillott (34) has summarized the effects of silica fume as both physical (reduced permeability) and chemical (reduction in pore alkalinity). He also indicated that expansion may continue in the long term, possibly through regeneration or slow release of alkalis. Replacement of 10-15 percent cement with silica fume is the normal range considered effective. Silica fume has only limited ability to suppress carbonate reaction.

Slags in replacement amounts in the order of 50 percent have been found to limit expansion of test specimens (41).

Calcined clays or shales have been studied and used (41, 42) in mitigating the effects of reactive aggregates. In some instances, they appear effective at replacement levels of 15 percent but with fairly low alkali cements (42). In other tests, they were considered noneffective (41).

Recent investigations into use of chemical admixtures (43) has shown promise in controlling adverse cement-aggregate reactions.

4.0 SITE VISITS AND CASE STUDIES

4.1 General

In order to assess the alkali-reactivity of potential concrete aggregates throughout the Province, it was reasoned that a general review of concrete structures of varying ages and geographic locations should be carried out. The review would assess the performance of these structures with particular emphasis on deterioration which might be attributed to alkali aggregate reaction or lack thereof. A representative group of structures showing both deficient and good durability performance would then be selected for petrographic and case history studies to ascertain if aggregate petrography could be linked to performance, especially with respect to alkali aggregate reactions. These phases of the work are discussed in the following sections.

4.2 Site Visits

One hundred and eighty-three concrete structures were visited throughout the Province during the fall of 1985. A brief description of the condition of the concrete was made and photographs of each structure obtained. The location and age of each structure visited is shown on Figure 4.1 attached. Detailed descriptions are presented in Appendix A.

In addition, the work of Cox (6) and Kierstead (8) was reviewed so that structures investigated in their research could be classified and used in the present study. This added an additional ninety-nine structures, giving a total of 282 reviewed or visited. The structures reviewed by Cox and Kierstead are also shown on Figure 4.1. As can be seen, these structures are all in southern New Brunswick, lying mainly east of the Saint John River. Most of the structures investigated were highway or railway bridges or dams, in all cases a severe environment with respect to alkali-aggregate reaction.

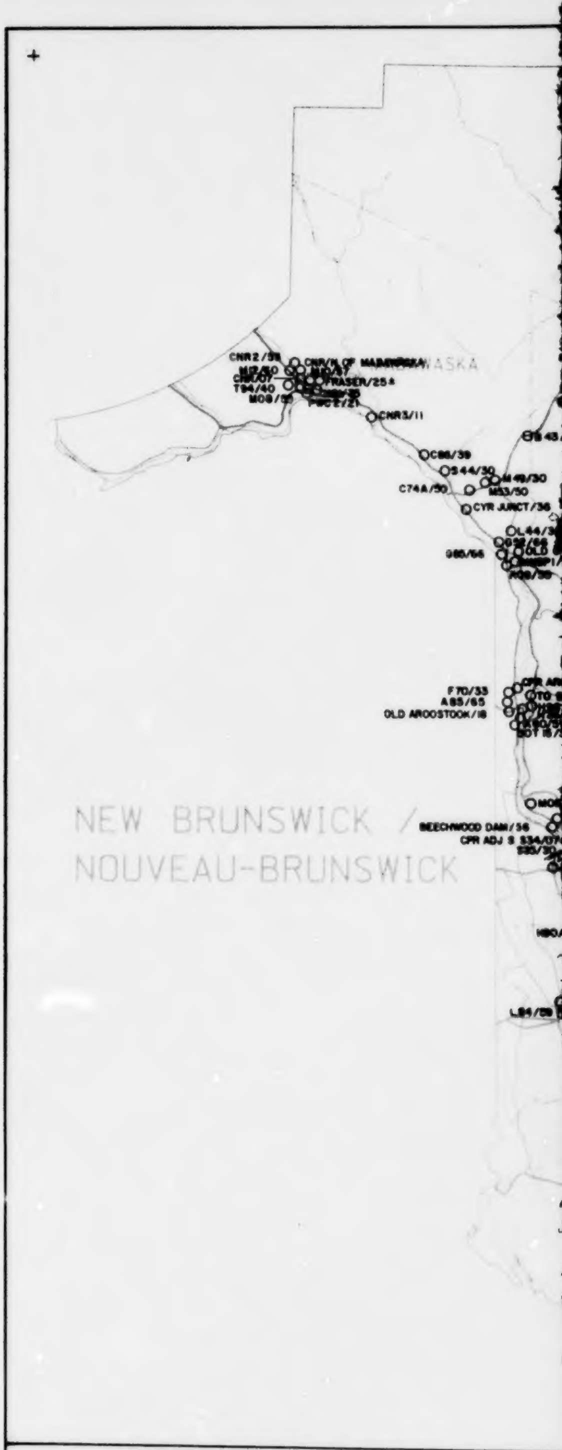
Each structure's performance was classified as described in Table 4.1 and typical photographs showing each classification are attached as Figures 4.2, 4.3, 4.4 and 4.5.

TABLE 4.1

CLASSIFICATION CRITERIA

1. Unaffected - no evidence of pattern cracking or expansion which could be related to AAR. Concrete is generally sound. May have other defects such as scaling, etc.
2. Trace - parts of structure show traces of fine pattern cracking, generally not too extensive. Cracks are generally tight and not leached. Structural capacity unaffected.
3. Intermediate - parts of structure show pattern cracking, cracks are more extensive and some may be open slightly. Some leaching and staining of cracks. Minor crumbling along some cracks. Structural capacity unaffected.
4. Severe - fairly extensive cracking over a significant part of the structure, may be evidence of expansion such as spalling at expansion joints, cracks have significant width and generally extensive leaching, may be considerable distintegration or repairs have been made. May affect structural capacity of thin members.

The results of the classification process are illustrated on Figure 4.6 which shows all the reviewed structures, classified into one of the four categories indicated in ten year age groupings. Figure 4.6 also indicates approximate geological boundaries, including the Matapedia Zone where natural gravels



CNR2/38
M12/50
CNR/07
T94/40
M08/50
FRASER/25
CNR3/11
C86/39
S44/30
M49/30
M53/50
C74A/50
CYR JUNCT/36
G85/66
F70/33
A85/65
OLD AROOSTOOK/18
BEECHWOOD DAM/56
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK

STUDY OF THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

FIGURE 4.1 PLAN SHOWING LOCATIONS OF FIELD VISITS

LEGEND

○ .... STRUCTURES VISITED DURING STUDY
● .... STRUCTURES REVIEWED FROM PREVIOUS STUDIES (COX, 1980)
M60/82 ... STRUCTURE IDENTIFICATION / YEAR STRUCTURE BUILT

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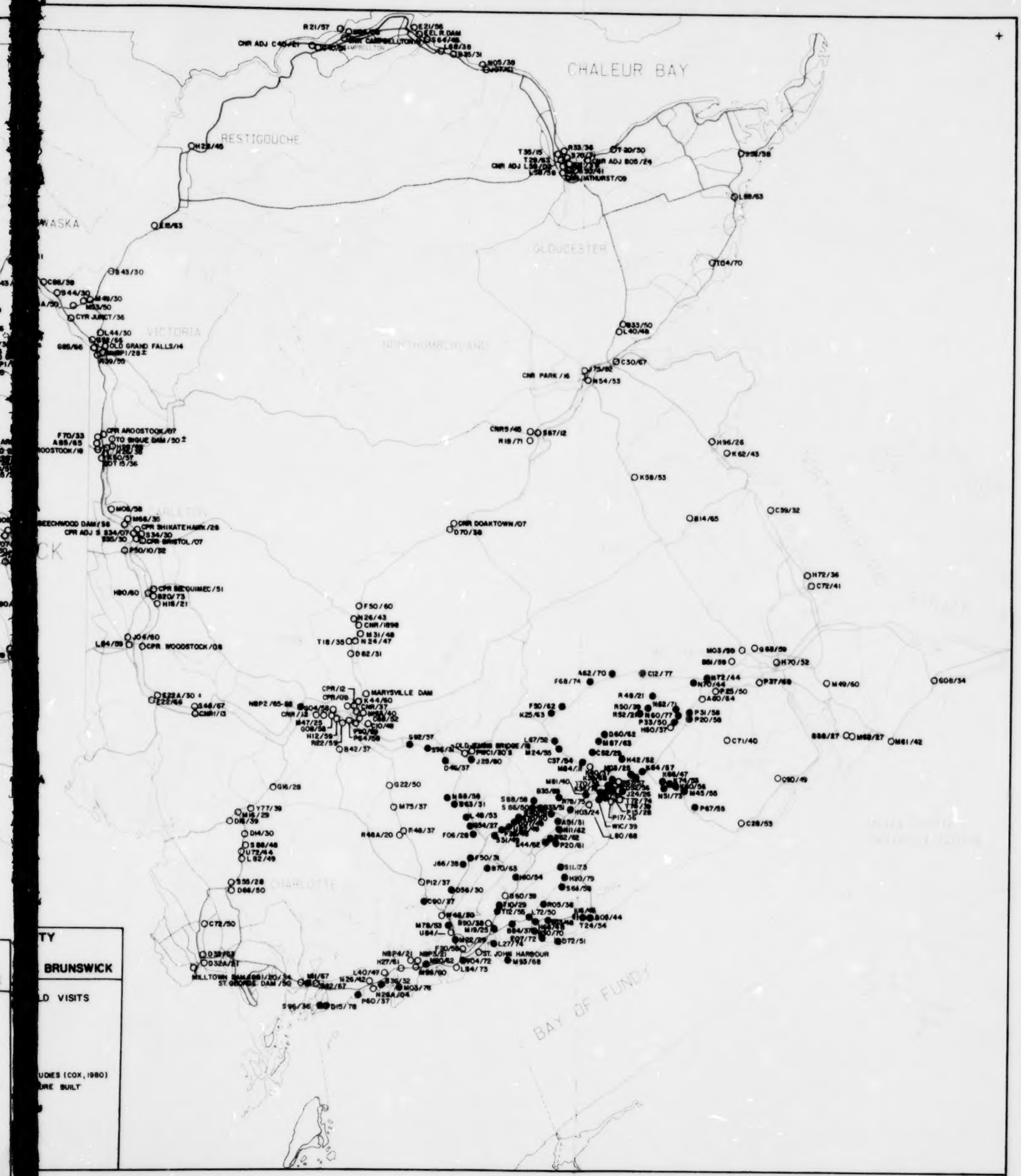

CHALEUR BAY
RESTIGOUCHE
WASKA
GLOUCESTER
VICTORIA
NORTHUMBERLAND
CARLETON
CHARLOTTE
BAY OF FUNDY
R21/57
E21/56
EEL R. DAM
CNR CAMPBELLTON
S64/46
L66/38
B35/31
N05/38
CNR ADJ C40/21
CAMPBELLTON
H23/46
T35/15
T28/62
R33/36
T20/50
CNR ADJ L58/02
CNR ADJ B05/24
L58/56
BATHURST/09
C59/56
L68/53
L16/53
T04/70
B43/30
C86/39
S44/30
M49/30
M33/50
CYR JUNCT/36
L44/30
OLD GRAND FALLS/14
G85/66
M39/50
B33/50
L40/46
C30/67
CNR PARK/16
N54/53
CNR5/46
S67/12
R18/71
H96/26
K62/43
K58/53
F70/33
A65/63
CPR AROOSTOCK/07
TO BIQUE DAM/50 ±
AROOSTOCK/19
K60/57
DOT 15/36
M05/38
BEECHWOOD DAM/56
M66/36
CPR SHIKATEHAWK/28
CPR ADJ S S34/07
S34/30
S35/30
CPR BRISTOL/07
P50/10/82
C39/32
B14/65
CNR DOAKTOWN/07
D70/38
H72/36
C72/41
H90/60
CPR BEQUIMEC/51
B20/73
H16/21
F50/60
N26/43
CNR/1898
M31/48
T18/35
N24/47
D62/31
L84/59
J06/60
CPR WOODSTOCK/08
M03/59
G68/59
B81/59
H70/52
A62/70
C12/77
F68/74
N72/44
N70/44
P37/68
P25/50
M49/50
G08/34
A60/64
E22A/30
E22/66
S46/67
CNR1/13
CPR/12
CPR/09
MARYSVILLE DAM
K44/60
CNR/37
NBP2/65-68
CNR/13
M47/25
G08/58
H12/59
R22/59
P64/56
B42/37
F50/62
K25/63
R48/21
R50/39
R52/21
N60/77
P33/50
H50/37
P31/56
P20/56
C71/40
S86/27
M68/27
M61/42
S92/37
OLD JEMSEG BRIDGE/18
P9C1/30'S
J25/60
D46/37
L67/58
M24/35
D60/62
M87/63
C37/54
C52/25
H42/58
K64/57
K66/47
M64/57
M81/40
N51/73
M45/56
J24/26
P17/36
W1C/39
L80/68
P67/59
C90/49
C28/53
G16/28
G22/50
M75/37
Y77/39
M16/29
D16/39
D14/30
S66/48
U72/44
L62/49
R46A/20
R46/37
N88/56
B63/31
S68/58
S66/50
B35/59
M78/75
N03/24
A51/51
N11/62
M12/62
P20/61
S44/62
L48/53
N54/27
F06/29
J66/39
F50/31
B70/63
S11/73
N20/79
S66/56
N60/54
S55/28
D66/50
P12/37
D58/30
C90/37
B50/39
R05/36
F10/29
T12/56
L72/50
M46/50
M78/53
B90/38
U84/—
M19/25
B84/37
S08/44
T24/54
E07/72
N30/70
D72/51
M22/29
L27/74
C72/50
F30/56
ST. JOHN HARBOUR
M93/68
NBP4/21
NBP3/21
H27/61
N80/62
B04/72
N96/60
L84/73
D32/63
D32A/67
MILLTOWN DAM
S81/30/34
ST. GEORGE DAM/50
M81/67
L40/47
N26/42
B36/32
M03/76
N26A/04
S96/36
D15/78
P60/37

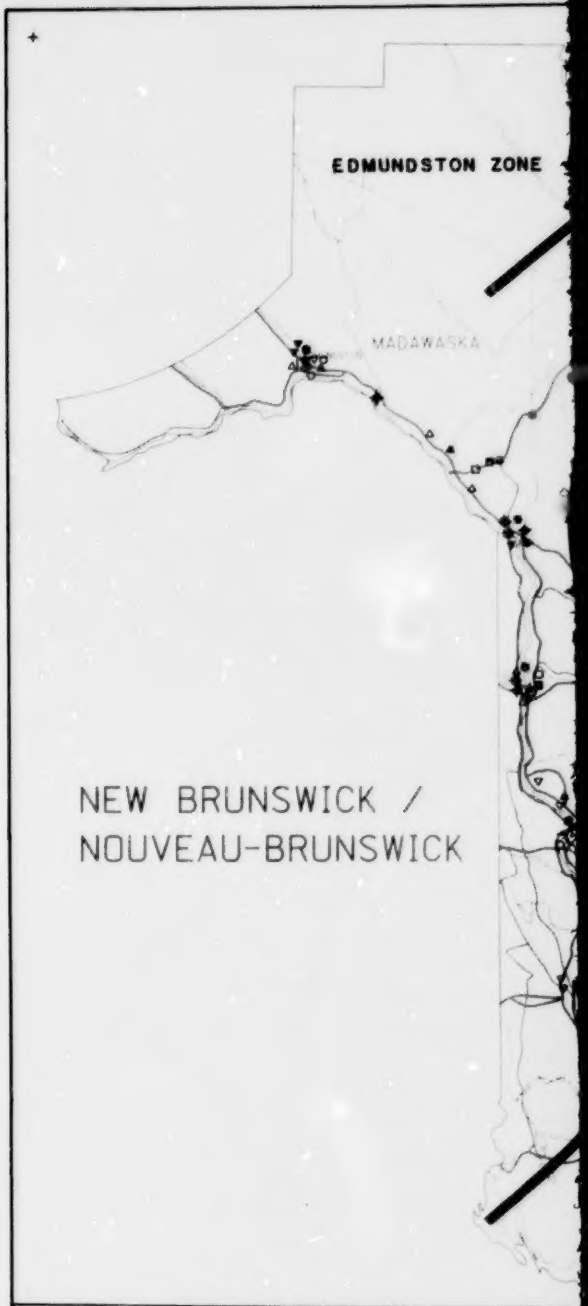
TY

BRUNSWICK

LD VISITS

UDIES (COX, 1980)

URE BUILT


EDMUNDSTON ZONE
MADAWASKA
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK

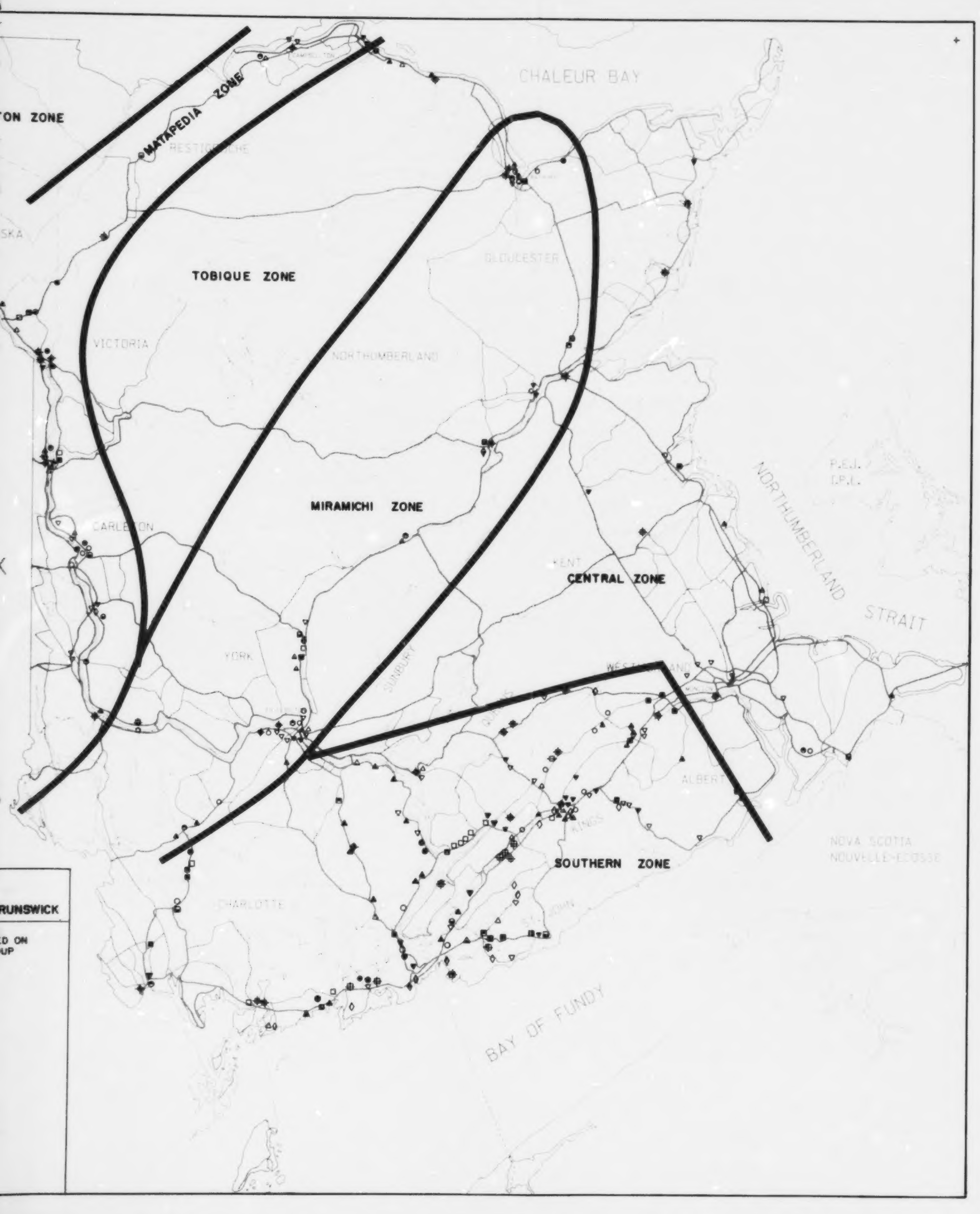
STUDY OF THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

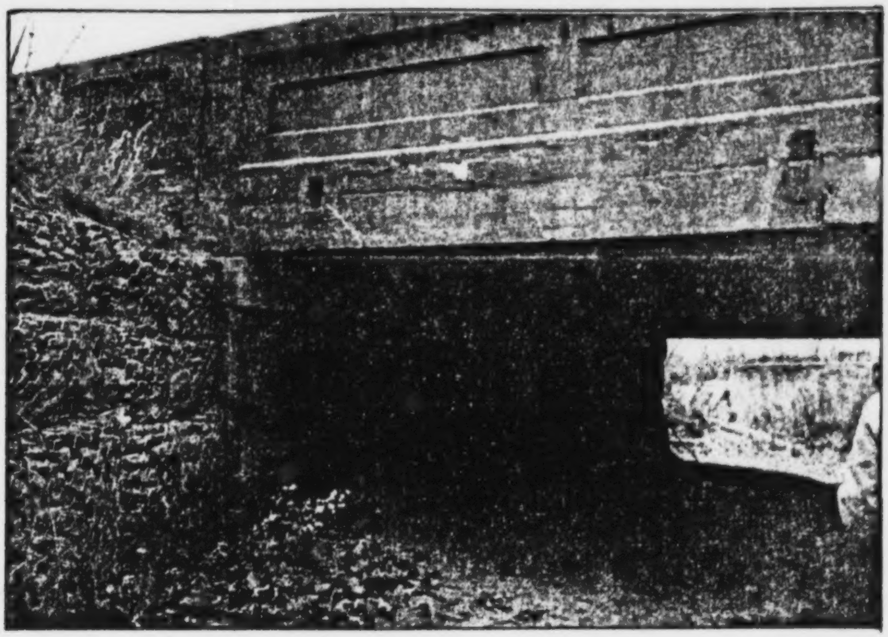
FIGURE 4.6 CLASSIFICATION OF STRUCTURES BASED ON DEGREE OF REACTIVITY AND AGE GROUP

KEY :

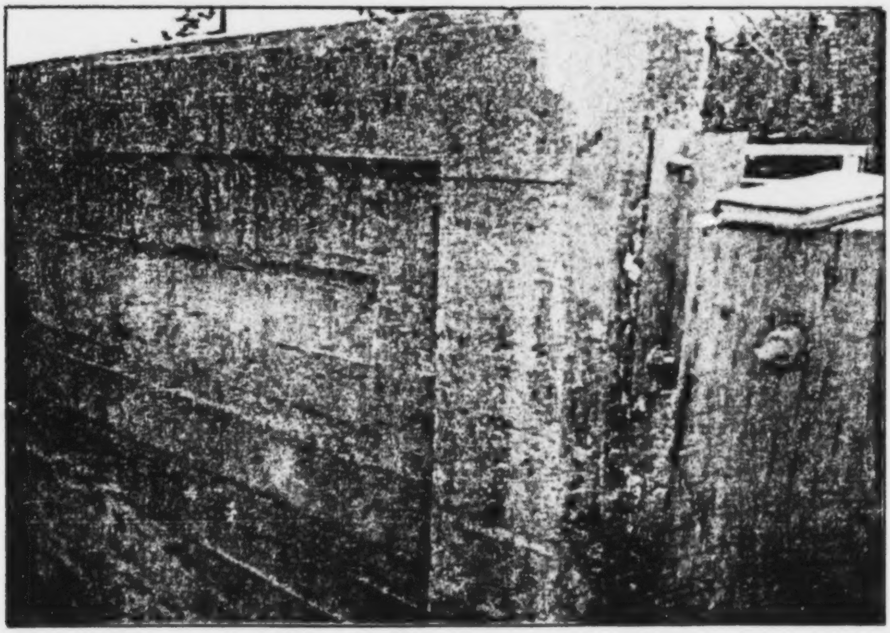
YEAR STRUCTURE BUILT	DEGREE OF ALKALI AGGREGATE REACTIVITY			
	NONE	TRACE	INTER-MEDIATE	SEVERE
1900 – 1910	○	◓	◒	●
1911 – 1920	⊕	⊕	⊕	◆
1921 – 1930	○	◓	◒	●
1931 – 1940	△	▲	▲	▲
1941 – 1950	□	■	■	■
1951 – 1960	▽	▼	▽	▼
1961 – 1970	⊞	⊞	⊞	●
1971 – 1985	◇	◆	◆	◆

1284-30/P-102


CHALEUR BAY
TON ZONE
MATAPEDIA ZONE
RESTIGOUCHE
CAMPBELLTON
SKA
TOBIQUE ZONE
GLOUCESTER
VICTORIA
NORTHUMBERLAND
P.E.I.
I.P.E.
NORTHUMBERLAND STRAIT
MIRAMICHI ZONE
CARLETON
KENT
CENTRAL ZONE
YORK
SUNBURY
WESTMORLAND
QUEENS
ALBERT
KINGS
NOVA SCOTIA
NOUVELLE-ECOSSE
SOUTHERN ZONE
CHARLOTTE
ST. JOHN
BAY OF FUNDY
RUNSWICK
ED ON
UP



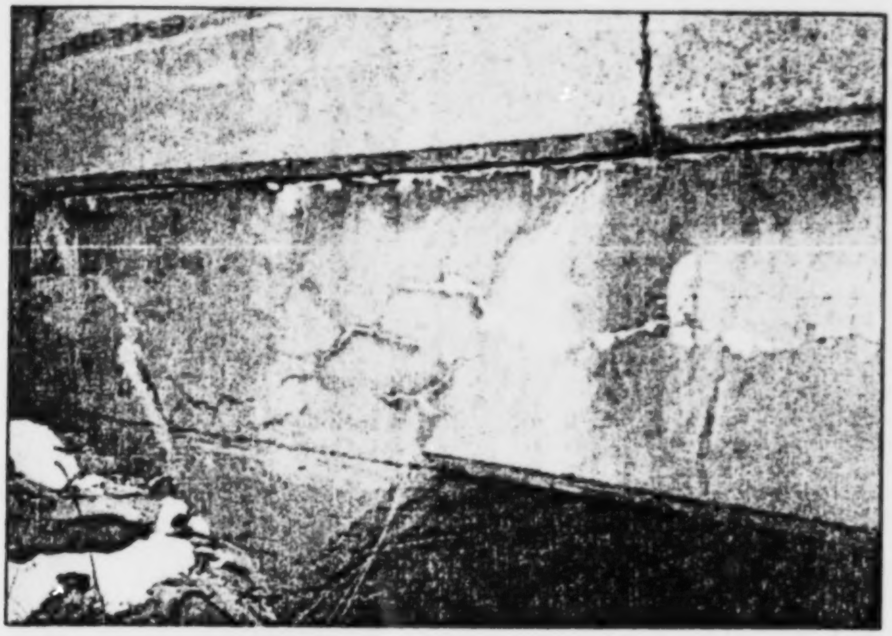
DOT 2, P15, built 1928, Main Street, Sussex, N.B.



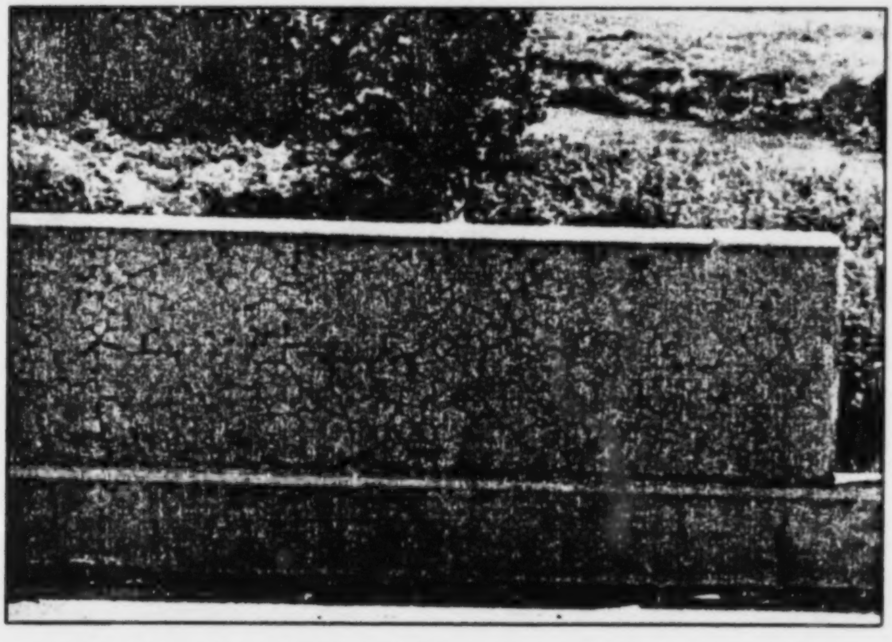
DOT 24, B35, built 1931, Rte. 11, Benjamin River
(main arterial highway)

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL
CONCRETE AGGREGATES OF NEW BRUNSWICK

FIG. 4.2 Typical Examples Showing Unaffected
Structures



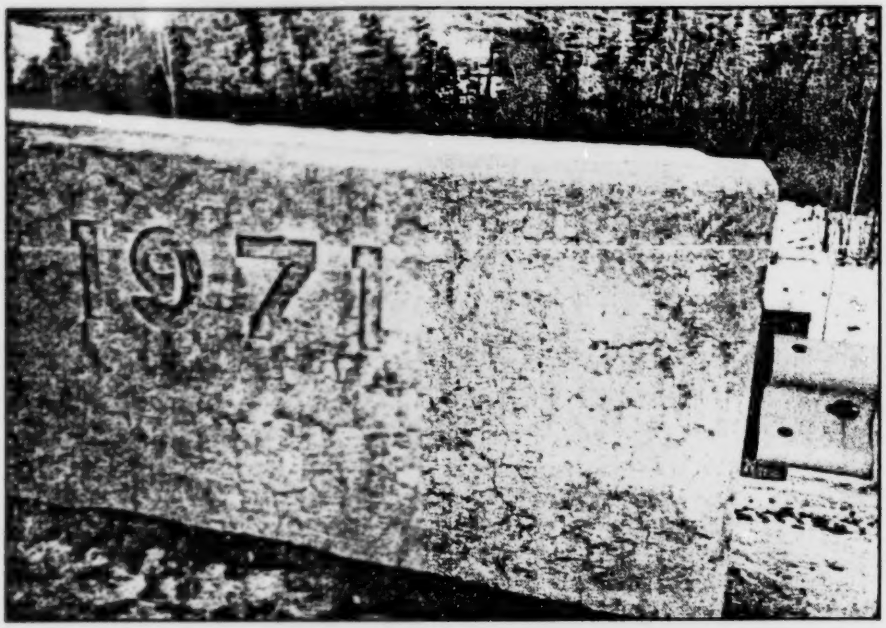
DOT 36, S55, built 1958, Rte. 11, Pokemouche, N.B.
(main arterial highway)



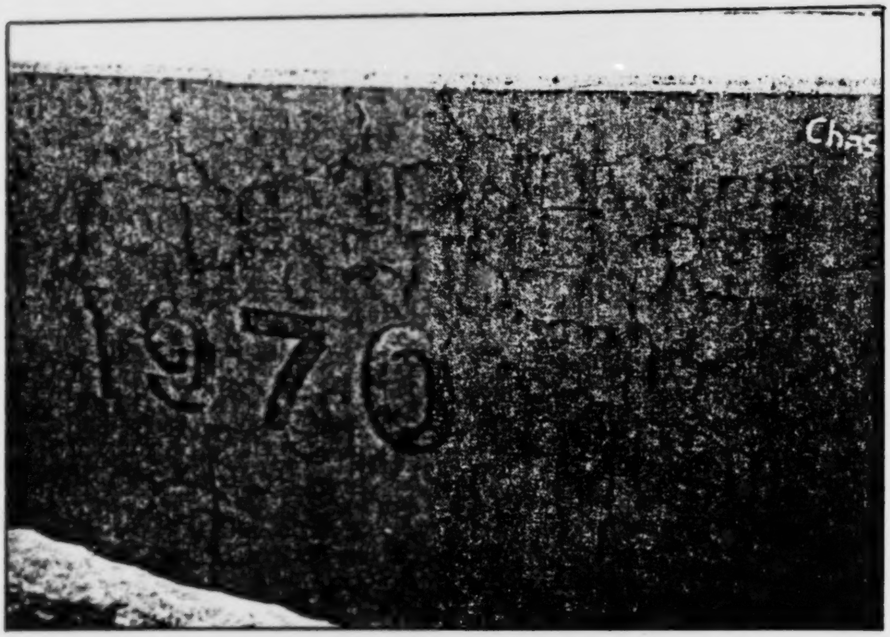
DOT 41, K38, built 1968, Rte. 2, Sussex, N.B.
(main arterial highway)

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL
CONCRETE AGGREGATES OF NEW BRUNSWICK

FIG. 4.3 Typical Examples Showing Trace Reaction



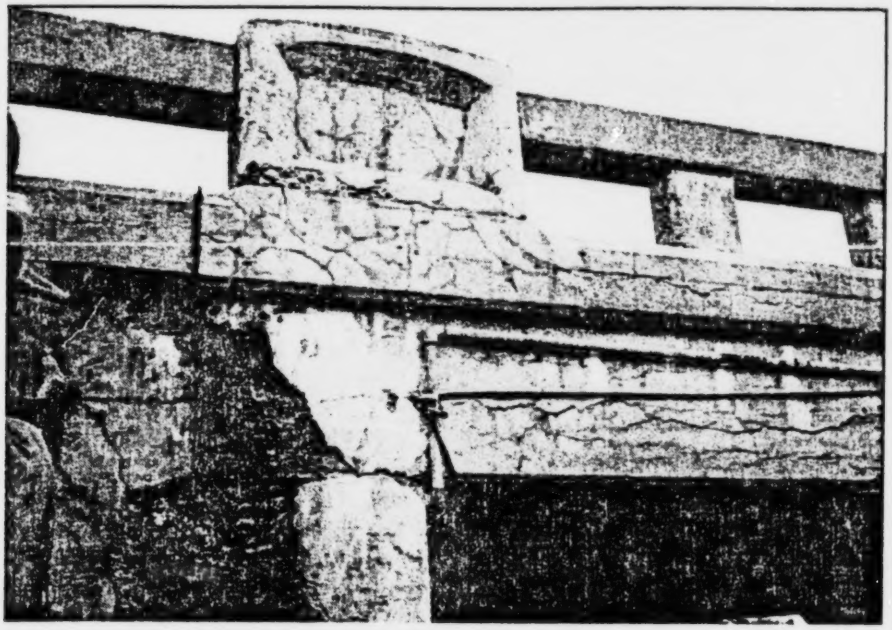
DOT 33, R18, built 1971, Rte. 8, Renous, N.B.
(main arterial highway)



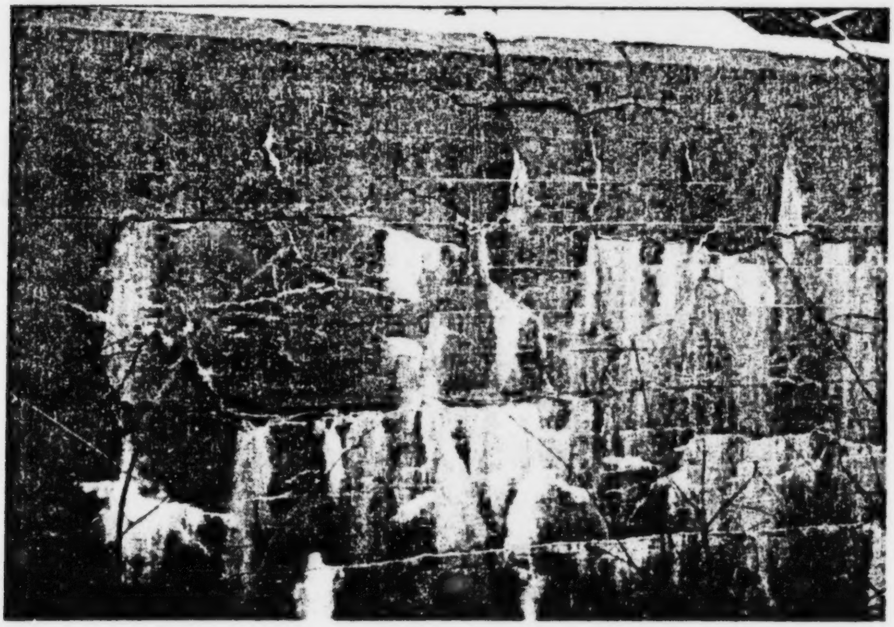
DOT 35, T04, built 1970, Rte. 11, Tabusintac, N.B.
(main arterial highway)

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL
CONCRETE AGGREGATES OF NEW BRUNSWICK

FIG. 4.4 Typical Examples Showing Intermediate Reaction



DOT 10, P57, built 1957, Rte. 2, Sussex, N.B.
(main arterial highway)



CNR2, built 1953, Railway Bridge, Edmundston, N.B.

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL
CONCRETE AGGREGATES OF NEW BRUNSWICK

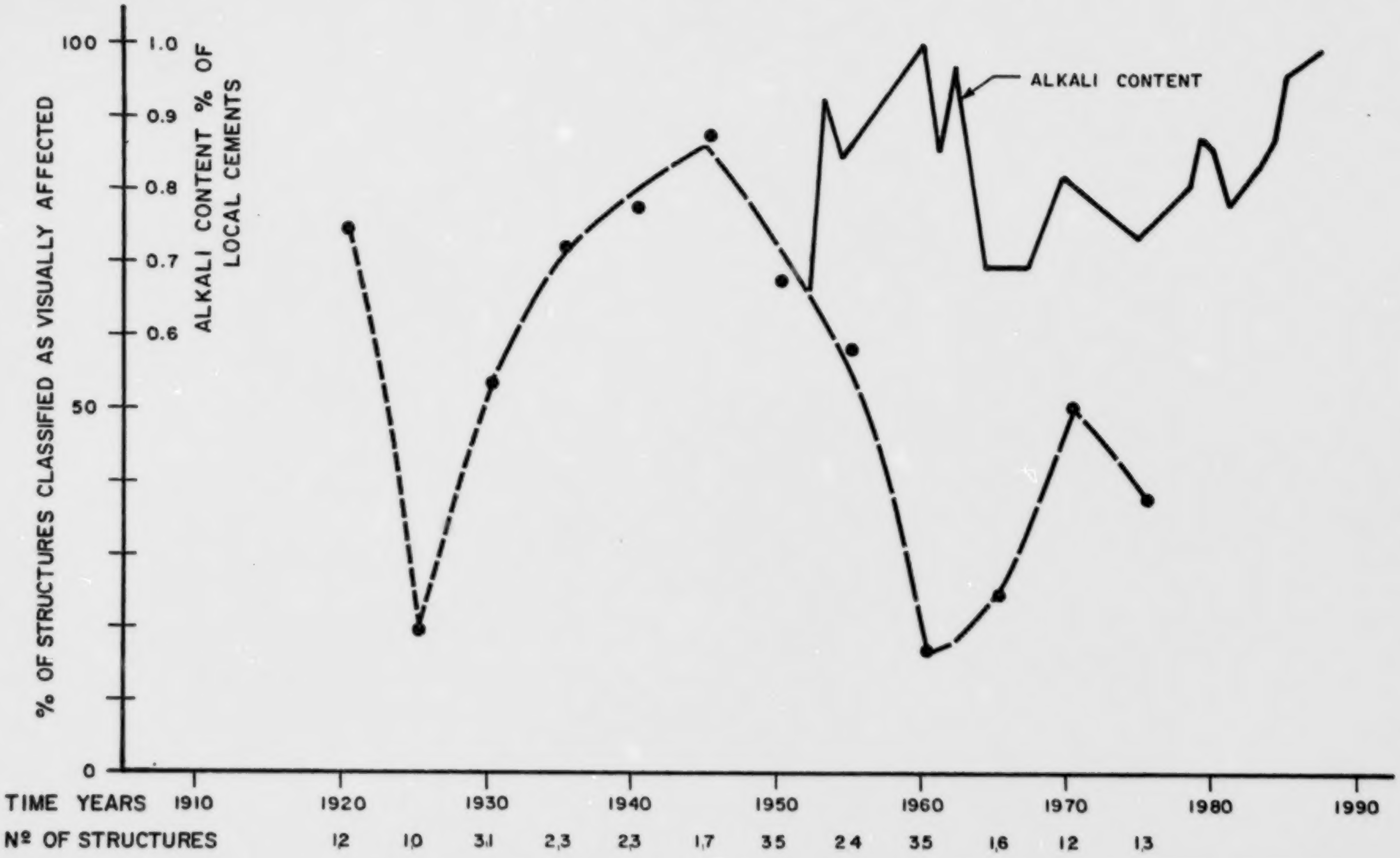
FIG. 4.5 Typical Examples Showing Severe Reaction

contain an appreciable proportion of limestone; and the Miramichi Zone where natural gravels contain a proportion of granitic rocks derived from the central Miramichi belt. The Southern Zone comprises Devonian granites intruding Silurian greywackes and other sediments. The Central zone is comprised mainly of Precambrian rocks which lie south of the weaker Carboniferous sandstones of central and eastern N.B.

Figure 4.7 shows graphically the results of the classification as between structures judged unaffected and those affected by alkali reactivity. The structures were grouped into five year age groups based on construction dates. Also shown on Figure 4.7 are the number of structures in each age grouping and the available data on alkali content of New Brunswick produced cements during the period. As noted, the classification is based on visual examination. However, as discussed in Section 4.3, petrographic studies on concrete samples from a selection of these structures has confirmed that those classified visually as showing evidence of distress, were indeed undergoing alkali-aggregate reactions.

The percentage of structures showing visual evidence of reaction reaches a peak of about 88 percent in the period 1943-1948, then declines to a low of about 18 percent in the period 1958-1963, rising to about 50 percent in the period 1968-1973. From about 1965 there appears to be some correlation with the alkali content of local cements which are also shown on Figure 4.7. Before 1963, the number of structures classed as affected are generally declining, although the alkali content of the local cements is high, generally in the range of 0.9-1.0 percent.

Figure 4.8 illustrates the classification of structures by the degree of severity of reaction. In general, the trends are similar to those shown in Figure 4.7. No structures classified



CLASSIFICATION OF AFFECTED AND UNAFFECTED STRUCTURES

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Fredericton, NB Canada

Project	1264 - 30	
Dwg.	FIGURE 4.7	
Drn. By	Scale	Date
R. C.		0

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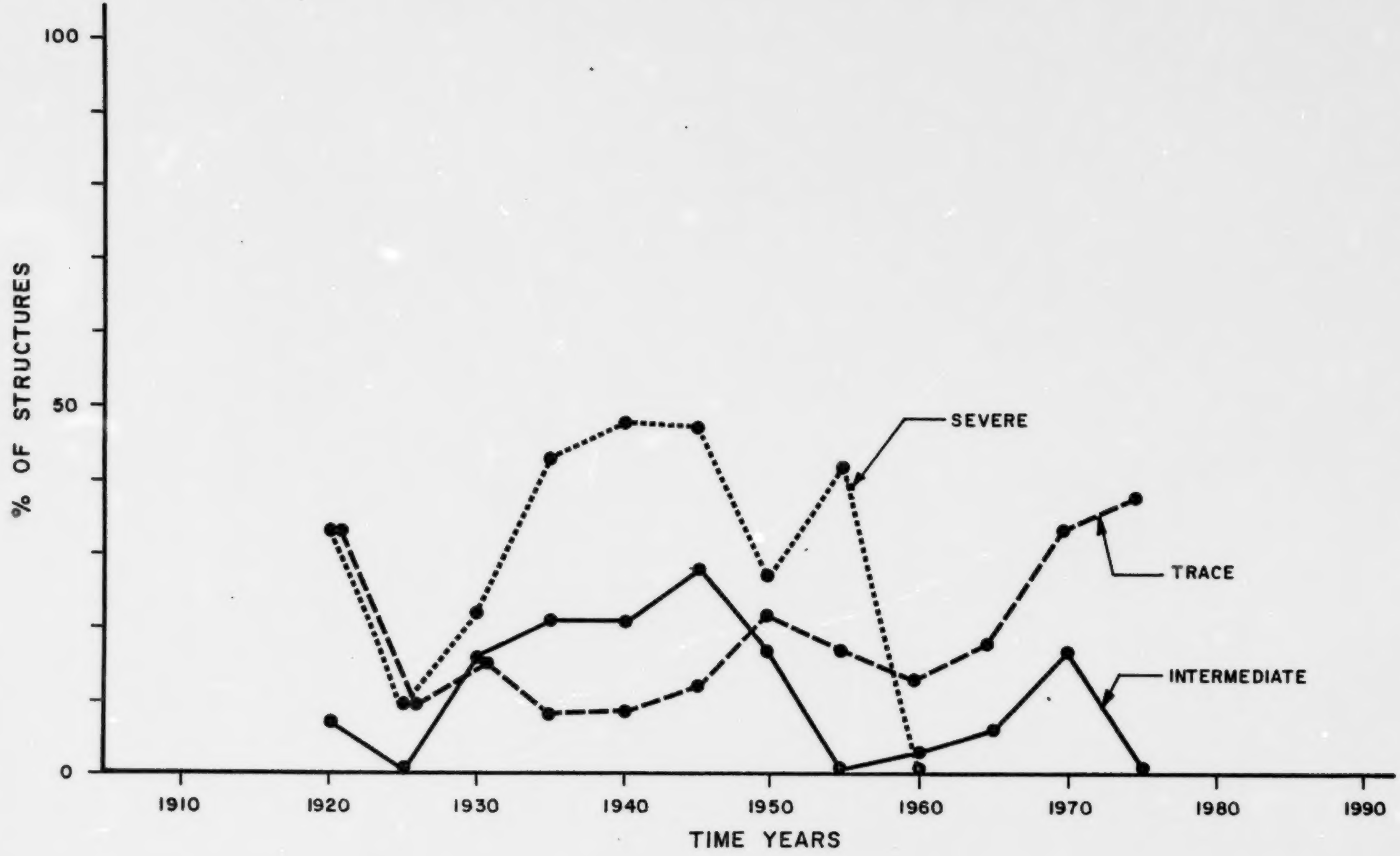

CLASSIFICATION OF DEGREE OF ALKALI REACTIVITY IN STRUCTURES REVIEWED (BASED ON VISUAL CLASSIFICATION)

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Project 1264 - 30		
Dwg. FIGURE 4.8		
Drn. By P.R.C.	Scale —	Date 02 / 88

ADI107

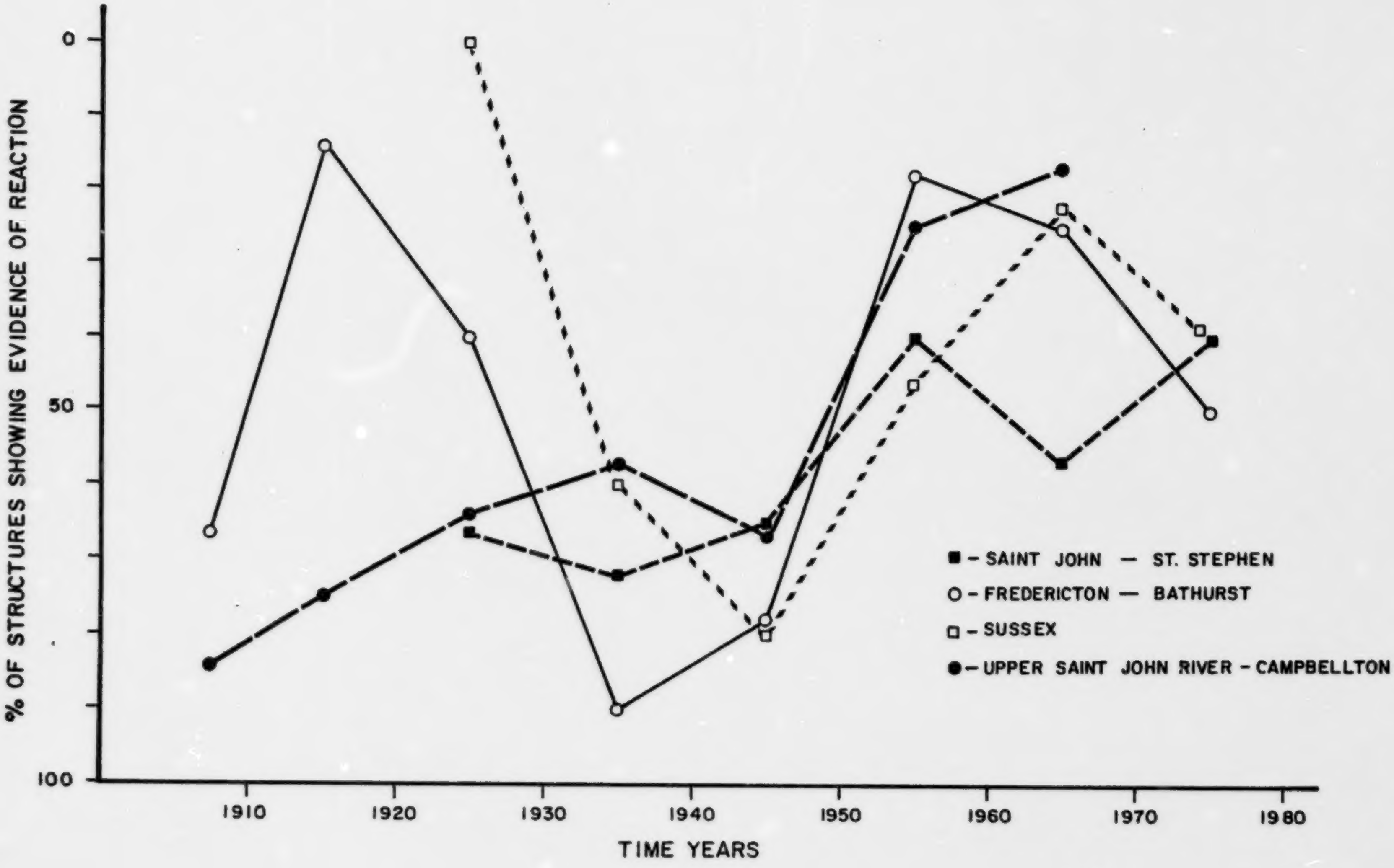
as severe were noted after 1958. These structures also show two peaks, one in the 1953-1958 period and a second in the 1938-1948 period. The percentage of structures showing traces of reaction is relatively high in the 1970s, then declines as the structures age. This is attributed to two factors; a relatively low cement alkali content in the mid 1960s and older structures suffering progressive deterioration which transfers them into the intermediate or severe class over time.

Based on the review of these structures, it appears that evidence of reactivity may take in the order of 8-10 years to show even traces, and 20 to 30 or up to 40 to 50 years to become severe. This is consistent with the experience of others (11) and with the rock types identified in Section 5; predominantly argillaceous, greywackes, etc., which are prone to the slow late expanding silicate/silica reaction.

An attempt was made to determine if there was any correlation of damage with the geologic areas indicated on Figure 4.6.

Figure 4.9 illustrates the percentage of structures showing evidence of reaction on a regional basis. Although there is considerable scatter in the results, there are no discernible trends which would indicate superior performance on a regional basis. The Moncton and eastern coast structures were not included in this analysis due to the small number of structures (20) reviewed in that region. Figure 4.10 illustrates the distribution on a regional basis of structures showing evidence of severe reaction. It would appear from these data that the southern part of the Province has more cases of severe reaction than the north.

As discussed in Section 5, this may be due to the fact that, in general, the natural gravels in the southern part of the Province, particularly around the Saint John area, have a higher



STRUCTURES SHOWING EVIDENCE OF REACTION ON A REGIONAL BASIS

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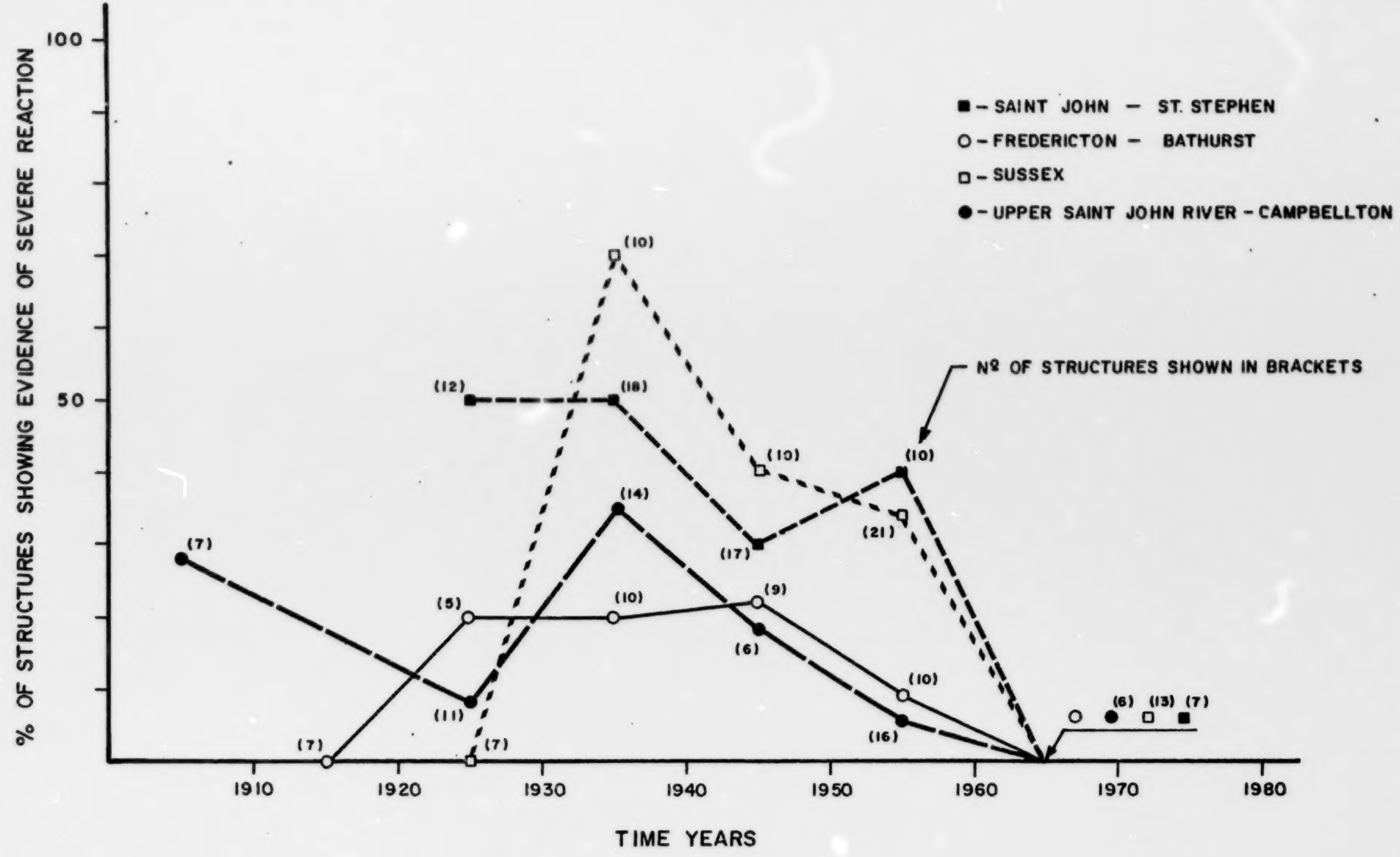
Project 1264 – 30
Dwg. FIGURE 4.9

Drn. By	Scale	Date
P.R.C.	—	02/88



STRUCTURES SHOWING EVIDENCE OF SEVERE REACTION ON A REGIONAL BASIS

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Dwg. FIGURE 4.10

Drn. By P.R.C

Scale

Date

percentage of rock types (70-80 percent) which have been identified in other jurisdictions as being potentially deleterious.

Two facts became obvious during the site visits. The first was that structures in the same geographic location and environment have exhibited a wide range of durabilities. One of the best examples is from the Sussex area where structure P-15, built in 1928, remains in excellent condition (see Figure 4.2). Structure P-17, built in 1936, approximately one mile distant across the same stream, has required extensive repairs and the unrepaired portions show evidence of substantial distress. Other examples could also be cited; however, the evidence is that materials which have been used in the past have resulted in both highly durable concretes as well as concretes suffering from alkali aggregate reactions.

The second point which became evident during site visits was that distress which appeared to be due to alkali aggregate reactivity is closely related to exposure conditions. In general, the more exposed parts of bridges such as guard rails, posts, edges of deck and retaining walls appear to show evidence of distress first. The more protected portions of structures such as central underside of deck, foundations, etc., generally do not show as much deterioration. In some instances retaining walls which are most exposed to sun show evidence of distress, whereas those in the shade on the same structure appear visually unaffected.

Some of these effects may be related to freeze thaw cycles, i.e., more freeze thaw on portions exposed to the sun. They may also be directly related to alkali-reactivity through factors such as average higher temperature resulting in more rapid reactions; migration of alkalis within the concrete due to temperature induced moisture gradients; higher humidity due to moisture splash from the roadway; and increase in the availability of total alkalis from the presence of deicing agents, particularly in the splash zone.

As discussed in Section 3, deicing salts can result in accelerated distress to reinforced concrete in a variety of ways unrelated to aggregate reactions, once cracking renders the concrete permeable to salt solutions.

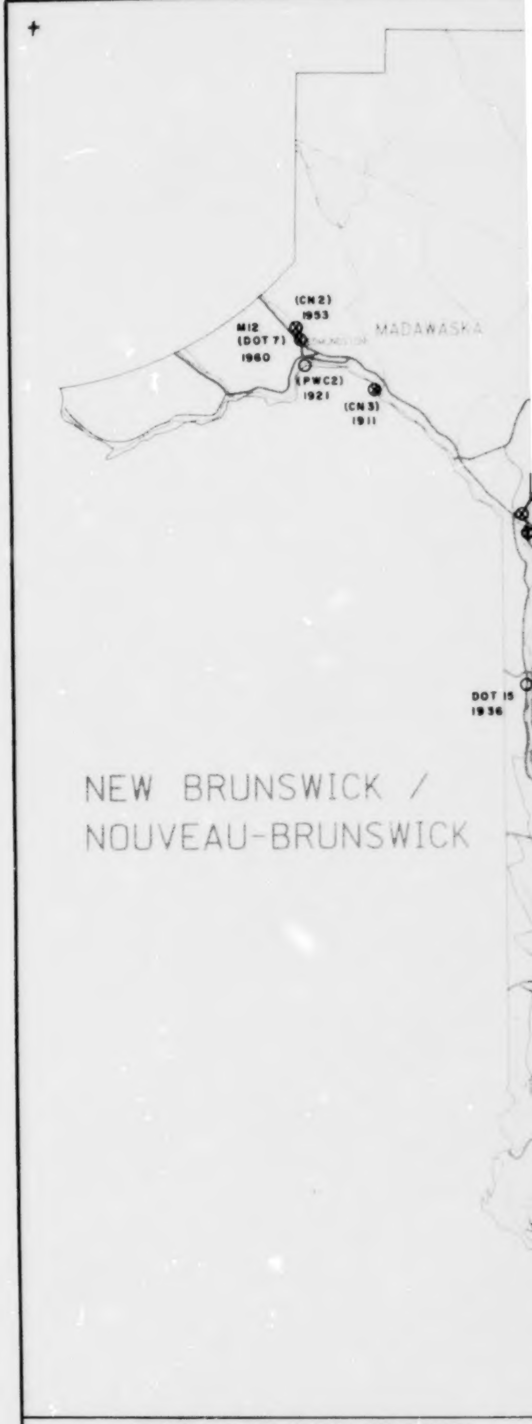
It is, however, obvious that distress can occur in locations where little, if any, salt exposure would be expected, such as dams, railway bridge abutments and piers, etc., examples of which have been found during the study.

One of the purposes of site visits to field structures was to select representative structures for sampling of hardened concrete, petrographic analyses and case history records. These aspects of the study are presented in the following section.

4.3 Case Studies

4.3.1 Selection and Field Work

Fifty-five structures were selected to obtain concrete samples for petrographic studies and to trace historical records where possible. An attempt was made to select regionally, within the Province, structures of various age classes and performances for these studies. Figure 4.11 illustrates the location and identification of structures selected. Pertinent details with regard to each structure showing location, construction date, details on performance, aggregates, etc., together with typical photographs are given in Appendix B.


(CN 2)
1953
M12
(DOT 7)
1960
MADAWASKA
(PWC2)
1921
(CN 3)
1911
DOT 15
1936
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK

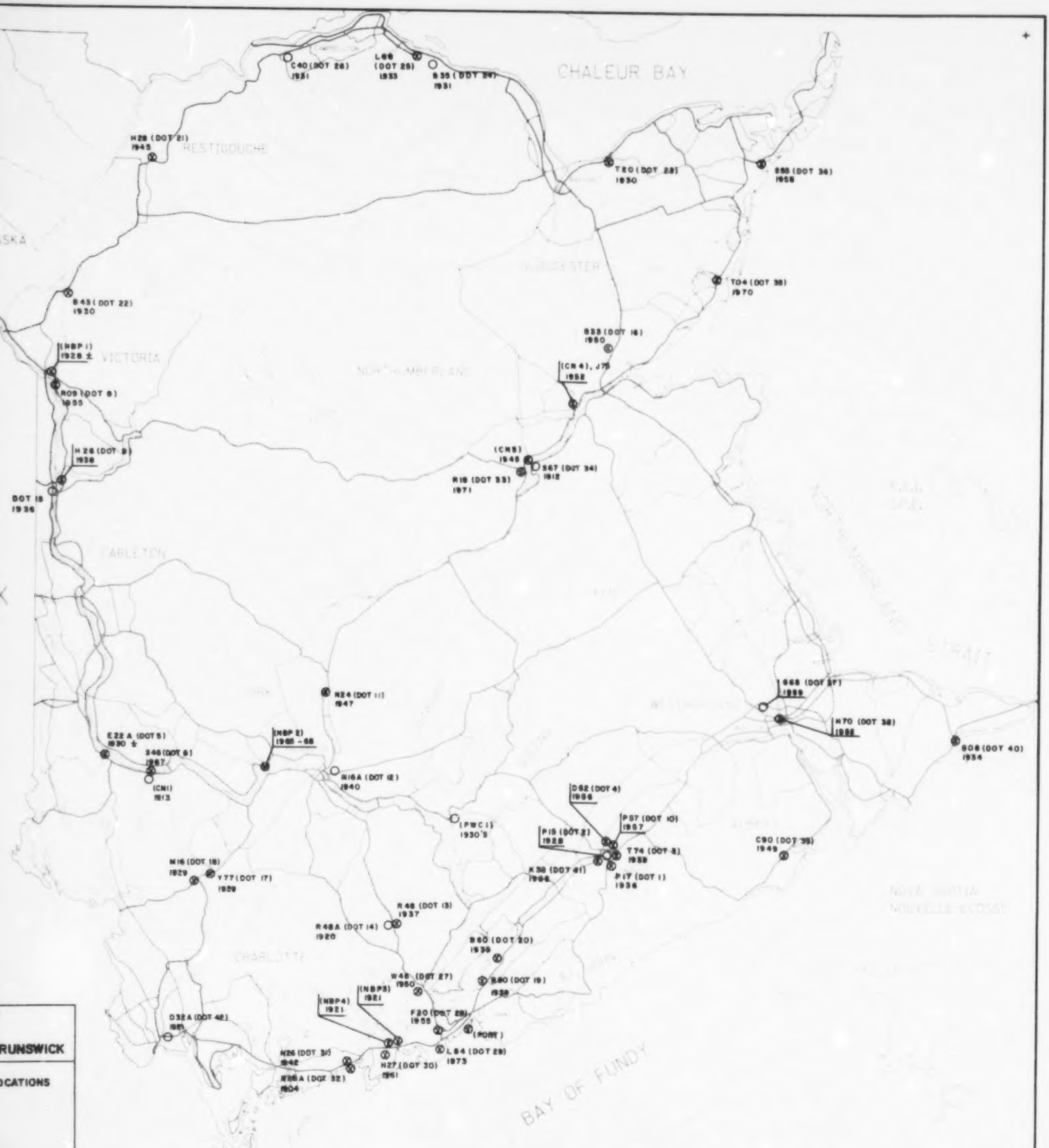
STUDY OF THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSW

FIGURE 4.11 PLAN SHOWING CONCRETE SAMPLE LOCATION

LEGEND

⊗.......... PROBABLE REACTIVE STRUCTURES
○.......... PROBABLE NON REACTIVE STRUCTURES
D32A..... OWNER STRUCTURE REFERENCE NUMBER
(DOT 42)... STUDY IDENTIFICATION NUMBER
  DOT........ NEW BRUNSWICK DEPARTMENT OF TRANSPORTATION
  NBP........ NEW BRUNSWICK ELECTRIC POWER COMMISSION
  CN.......... CANADIAN NATIONAL RAILWAY
  PWC .... PUBLIC WORKS CANADA
  PORT ...... PORTS CANADA

1264-30/P-101


CHALEUR BAY
C40 (DOT 26)
1931
L66
(DOT 25)
1933
B35 (DOT 24)
1931
H28 (DOT 21)
1945
RESTIGOUCHE
T20 (DOT 23)
1930
B55 (DOT 36)
1958
SKA
GLOUCESTER
T04 (DOT 38)
1970
B43 (DOT 22)
1930
B33 (DOT 16)
1950
(NBP 1)
1928 ±
VICTORIA
NORTHUMBERLAND
(CN 4), J75
1952
R09 (DOT 8)
1955
H26 (DOT 9)
1936
(CN5)
1948
S67 (DOT 34)
1912
R16 (DOT 33)
1971
DOT 15
1936
CARLETON
STRAIT
N24 (DOT 11)
1947
I66 (DOT 37)
1959
H70 (DOT 38)
1958
E22 A (DOT 5)
1930 ±
S46 (DOT 6)
1967
(NBP 2)
1965 - 68
N16A (DOT 12)
1940
(CN1)
1913
S06 (DOT 40)
1934
D62 (DOT 4)
1956
(PWC1)
1930'S
P57 (DOT 10)
1957
P15 (DOT 2)
1928
T74 (DOT 3)
1958
C90 (DOT 35)
1949
K38 (DOT 41)
1966
P17 (DOT 1)
1936
M16 (DOT 18)
1929
Y77 (DOT 17)
1929
NOVA SCOTIA
NOUVELLE ÉCOSSE
R48 (DOT 13)
1937
R48A (DOT 14)
1920
CHARLOTTE
B60 (DOT 20)
1935
W46 (DOT 27)
1950
B80 (DOT 19)
1938
(NBP3)
1921
(NBP4)
1921
F20 (DOT 28)
1955
D32A (DOT 42)
1961
(PORT)
RUNSWICK
N26 (DOT 31)
1942
L84 (DOT 29)
1973
H27 (DOT 30)
1961
N26A (DOT 32)
1904
OCATIONS
BAY OF FUNDY
RTATION
SION

Samples of hardened concrete were obtained from each structure for examination and future petrographic analysis. In most instances, the samples were 100 mm diameter by 300 mm long cores, but in a few cases actual fragments of the concrete were obtained. Descriptions of each core/sample are appended as Appendix C. Note that a few structures were sampled in two locations as various parts of the structure appeared to differ significantly in durability.

Of the total number of structures sampled, 45 percent were considered to show evidence of severe reaction; 15 percent intermediate and 16 percent trace reactions. Twenty-four percent of the structures were considered to be sound.

Table 4.2 shows the breakdown by age and severity of deterioration.

TABLE 4.2

CASE STUDY STRUCTURES GROUPED BY AGE
AND DEGREE OF REACTION

Age	Severe Reaction	Intermediate Reaction	Trace Reaction	No Reaction	Total
1900-10	1				1
1911-20	1			3	4
1921-30	6	1	1	3	11
1931-40	9			5	14
1941-50	3	3	1		7
1951-60	5	1	3	1	10
1961-70	-	2	3	1	6
1971-80		1	1		2

4.3.2 Petrographic Study of Hardened Concretes

Ten samples of hardened concrete were selected by Dr. J. Gillott of the University of Calgary for detailed petrographic study. Seven were from structures classified in the field as severely affected, two from intermediate cases and one from an older, sound structure.

Complete details of the petrographic studies are presented in Appendix D. The main points are summarized in Table 4.3 in Section 4.3.3 of this report.

Dr. Gillott's basic conclusion is that alkali-aggregate reaction was a major cause of concrete deterioration in the structures studied. Frost action was not felt to be a primary cause; however, the presence of ettringite in large amounts has raised some question as to the role of sulphates. Silica gel and microcracking were found in all structures field classified as showing evidence of reaction.

Nine of the structures had concrete manufactured with natural gravels and one from crushed greywacke. Greywacke was the type of aggregate most often associated with evidence of deterioration and it was the most abundant rock type in eight of the ten samples studied. Other rocks which showed evidence of poor performance included argillites, phyllites, chert and some granites.

Based on a comparison of aggregate types encountered in the samples, with the regional geology, Dr. Gillott concluded that five of the ten concretes were probably manufactured with imported aggregates.

Poor correlation was noted between the ages of the concretes and the degree of deterioration. The condition of the core samples was not always indicative of the field performance of the structure.

On immersion of the concrete in 2M NaOH at 38°C, silica gel formed on some aggregate particles at 7 days. As no additional gel formed after 7 days, it was concluded that the deposits had formed as a result of the migration and precipitation of material which already existed in the aggregate particles prior to the test. The rock type most frequently associated with formation of these deposits was greywacke, followed by chert and phyllite. The one sound structure studied showed no deposit formation on aggregate materials. Of the remaining nine, five which were field classified as severe showed significant formation of gel in this test, while two showed very little. Concrete from the two structures classed as intermediate showed significant gel formation in one case and minor in the other. Of these two, the concrete showing more gel formation was 19 years older and in substantially poorer condition than the newer structure.

4.3.3 Summary of Case Studies

An effort was made to obtain information on each structure selected as to age, type of structure, aggregates used in construction, etc., which might prove relevant to the study. In a great number of cases, no information other than the age of the structure was available. In some cases the aggregate source was known with a reasonable degree of certainty, especially in the more modern structures, and in other cases a source was noted but the reliability of the information was indicated to be questionable. No information was available on cements used in any of the projects studied. However, it is certain that a significant number of structures built in the period 1952-83 used cement from the local Havelock, N. B. plant. An indication of the typical alkali content of this cement is given in Section 3, Figure 3.3 for the period 1952 to 1983, when materials for manufacture began to be imported to the Province.

All known details of the structures investigated are summarized in Table 4.3.

A number of conclusions can be drawn from the information in the table. These include:

- petrographic analysis has confirmed that visual examination of field performance can determine with a high degree of success concretes that are suffering from alkali-aggregate reactions.

- at least seven structures in southern New Brusnwick that show evidence of distress due to alkali-aggregate reactions were built with concrete containing natural gravel aggregates from the Saint John area.

- three structures showing intermediate to trace reactions are known to have been constructed with Silurian greywackes and associated rocks from quarried sources near Fredericton. Other structures of the same general age and from similar exposure conditions built using the same aggregates show very little evidence of distress.

- at least two cases of severe reaction appear to be related to aggregates obtained from the banks of the Saint John River near Woodstock and Perth-Andover, respectively.

- in many instances, cores taken from structures showing evidence of deterioration appear from visual examination to be in better condition than the exterior of the

TABLE 4.3 DETAILS OF STRUCTURES

ALKALI-AGGREGATE REACTION STUDY - HARDENED CONCRETE SAMPLE DETAILS

DETAILS OF STRUCTURE								DETAILS OF PETROGRAPHIC STUDY OF HARDENED CONCRETE						
										EVIDENCE OF DISTRESS				
ID NO.	OWNER ID	TYPE	DATE BUILT	COUNTY	FIELD PERF	CORE DESC	AGGREGATE TYPE & SOURCE	AGGREGATE TYPES	SOURCE	Micro Cracking	Deposits	Rock Types Assoc. with cracking and deposits	Correlation of deposits and cracking	NAOH TEST
DOT 1	P17	HD	1936	KINGS	P-SR-REP	P-SC-R	G - Trout Creek? possibly from Saint John	G,QTZ,GR,A,P,MV,C	I	COMMON, P&A	E,G	G,A,P	POOR	VERY LITTLE DEPOSIT
DOT 2	P15	HB	1928	KINGS	G-NR	G	G - Trout Creek?	G,QTZ,MV,SS,GR,C,A	L	MINOR, A	NO	C,A	FAIRLY GOOD	NO CHANGE
DOT 3	T74	HB	1939	KINGS	P-SR-REP	F/G-C-R	G - Probably imported from Saint John							
DOT 4	D53	MB	1956	KINGS	P-SR-REP	P-SC-R	U - McNulty Pit, Saint John							
DOT 5	K22A	HD	1930	CARLETON	P-SR	P-SC-R	G - Saint John River bank, 2 miles above Meductic							
DOT 6	S46	MB	1967	CARLETON	G-MR/TR	G-O-MR	CR - Springhill (greywacke, agrillite), Zealand (sand)							
DOT 7	M12	HB	1960	MADAWASKA	G-TR	G-HC-TR	G - Source unknown							
DOT 8	R09	MB	1955	VICTORIA	G-TR	G-O-TR	G - Tom Lunn's Pit, lower end of Perth							
DOT 9	N26	HB	1938	VICTORIA	P-SR	F/G-C-R	G - Armstrong Pit behind old gov't garage, Andover							
DOT 10	P57	HB	1957	KINGS	P-SR	P-SC-R	G - McNulty Pit, Saint John							
DOT 11	N24	HB	1947	YORK	P-SR	P/P-SC-R	G - Source unknown	G,GR,QTZ,SS,V,P,C	L	COMMON, P&A	E,G	G,P,C,MV	FAIRLY GOOD	SIGNIFICANT DEPOSITS
DOT 12	N16A	MB	1940	YORK	G-MR	G-O-MR	G - Source unknown							
DOT 13	R48	HB	1937	YORK	P-SR	G-O-TR	G - Source unknown							
DOT 14	R48A	HB	1928	YORK	G-MR	G-O-MR	CG - Source unknown							
DOT 15	N29	HB	1936	VICTORIA	G-MR	G-O-MR	G - Source unknown							
DOT 16	B33	HB	1950	NORTHUMBERLAND	P-IR-REP	P/G-O-TR	G - Vicinity of bridge							
DOT 17	T77	HB	1939	YORK	P-SR	F-C-R	G - Source unknown							
DOT 18	N16	HB	1929	YORK	P/P-SR-REP	F/G-O-TR	G - Source unknown							
DOT 19	B90	HB	1939	KINGS	P-SR-D	P-SC-R	G - McNulty Pit, Saint John?							
DOT 20	B60	HB	1939	KINGS	P-SR	P-SC-R	G - McNulty Pit, Saint John?	G,GR,P,S,C,MV,MA	L	COMMON, P&A	E,G	G,P,S	FAIRLY GOOD	SIGNIFICANT DEPOSITS
DOT 21	N28	HB	1945	RESTIGOUCHE	F/G-IR	G-O-TR	G - Probably nearby pit							
DOT 22	B43	HB	1930	VICTORIA	F/G-IR	G-C-TR	G - Along Route 17 not far from bridge							

See Page 4.13 for Key to Table

TABLE 4.3 DETAILS OF STRUCTURES (CONTINUED)

ALKALI-AGGREGATE REACTION STUDY - HARDENED CONCRETE SAMPLE DETAILS

DETAILS OF STRUCTURE								DETAILS OF PETROGRAPHIC STUDY OF HARDENED CONCRETE		EVIDENCE OF DISTRESS				
ID NO.	OWNER ID	TYPE	DATE BUILT	COUNTY	FIELD PERF	CORE DESC	AGGREGATE TYPE & SOURCE	AGGREGATE TYPES	SOURCE	Micro Cracking	Deposits	Rock Types Assoc. with cracking and deposits	Correlation of deposits and cracking	NAOH TEST
DOT 23	T30	SB	1930	GLOUCESTER	P-SR	G-C-TR	G - Nearby beach gravel							
DOT 24	B35	SB	1931	RESTIGOUCHE	G-NR	G-O-NR	G - Beach sand?							
DOT 25	L60	SB	1933	RESTIGOUCHE	P-SR	F/G-C-TR	G - Beach sand?							
DOT 26	C40	SB	1931	RESTIGOUCHE	G-NR	G-O-NR	G - Nearby pit?							
DOT 27	W26	SB	1950	KINGS	P-SR-REP	F/G-TR	G - McNulty Pit, Saint John							
DOT 28	F30	SB	1955	CHARLOTTE	F/G-SR	G-O-TR	G - Source unknown	CR,G,V,C,LS,QTZ,F	L	COMMON	E, aaG.	C,F	FAIRLY GOOD	SIGNIFICANT DEPOSITS
DOT 29	L04	SB	1973	CHARLOTTE	G-TR	G-MC-NR	CG - Source unknown							
DOT 30	E37	SB	1961	CHARLOTTE	F/G-IR	G-O-TR	CG - Source unknown							
DOT 31	M26	SB	1962	CHARLOTTE	F/G-IR	F-SC-R	G - Source unknown							
DOT 32	M26A	SB	1904	CHARLOTTE	P-SR	F-SC-R	G - Source unknown							
DOT 33	B18	SB	1971	NORTHUMBERLAND	F/G-IR	G-O-NR	CR - Greywacke, argillite, Springhill, NB	G, SOME A,F,LS	I	COMMON, P&A	E, aaG	A,G	FAIRLY GOOD	FLECKS OF DEPOSIT
DOT 34	Ø67	SB	1912	NORTHUMBERLAND	G-NR	G-O-NR	G - Probably Saint John?							
DOT 35-1	Y04	SB	1970	NORTHUMBERLAND	G-NR	G-O-NR	G - Val Comeau (sand) Rough Waters Drive (stone)							
DOT 35-2	T04	SB	1970	NORTHUMBERLAND	F-IR	G-O-NR	CR - Crushed rock, probably Springhill, NB							
DOT 36	S55	SB	1958	GLOUCESTER	G-TR	G-O-TR	G - Four Roads beach gravel							
DOT 37	G68	SB	1959	WESTMORLAND	F/G-NR	G-O-NR	CR - Gorge Road Quarry							
DOT 38	N70	SB	1952	WESTMORLAND	F-IR	F/F-SC-R	G - Source unknown	SS,G,GR,MV,C,P,QTZ	L	COMMON	R,G	C,MV,G	FAIRLY GOOD	SIGNIFICANT DEPOSIT
DOT 39	C90	SB	1949	ALBERT	F/G-TR	G-O-TR	G - Source unknown							
DOT 40	O08	SB	1934	WESTMORLAND	P-SR	F-SC-R	G - Source unknown							
DOT 41	K38	SB	1960	KINGS	G-TR	G-O-NR	CG - McNulty Pit, Saint John							
DOT 42	D22A	SB	1921	CHARLOTTE	G-TR	G-MC-TR	G - Source unknown							
CNR 1		SB	1913	YORK	G-NR	G-O-NR	G - Source unknown							

See Page 4.13 for Key to Table

TABLE 4.3 DETAILS OF STRUCTURES (CONTINUED)

ALKALI-AGGREGATE REACTION STUDY - HARDENED CONCRETE SAMPLE DETAILS

DETAILS OF STRUCTURE								DETAILS OF PETROGRAPHIC STUDY OF HARDENED CONCRETE						
										EVIDENCE OF DISTRESS				
ID NO.	OWNER ID	TYPE	DATE BUILT	COUNTY	FIELD PERF	CORE DESC	AGGREGATE TYPE & SOURCE	AGGREGATE TYPES	SOURCE	Micro Cracking	Deposits	Rock Types Assoc. with cracking and deposits	Correlation of deposits and cracking	NAOH TEST
CNR 2	---	RB	1953	MADAWASKA	P-SR	F/G-C-R	G - Source unknown	G,A,GR,C,QTZ,P,LS	I	COMMON, P&A	E,G	G,P	FAIRLY GOOD	SIGNIFICANT DEPOSITS
CNR 3	---	RB	1911	MADAWASKA	P-SR	G-C-R	G - Source unknown							
CNR 4	J25	RB/HB	1952	NORTHUMBERLAND	F/G-SR	G-MC-TR	G - Source unknown	G,GR,QTZ,MV,S,C	I	FAIRLY COMMON	E,saG	G	FAIR	SIGNIFICANT DEPOSITS
CNR 5	---	RB	1945	NORTHUMBERLAND	P-SR	G-MC-R	G - Source unknown							
NBP 1	---	M	1928	VICTORIA	P-SR-D	P-SC-R	G - Possibly local or Woodstock area	G,A,P,C,SS,QTZ,V	I	COMMON, P	E,G	C,G	POOR	VERY LITTLE DEPOSIT
NBP 2	---	D	1967	YORK	G-TR	G-O-NR	CR - Local quarried greywacke							
NBP 3-1	---	D	1921	SAINT JOHN	P-SR	P-SC-R	G - Source unknown							
NPB 3-2	---	D	1921	SAINT JOHN	G-NR	G-MC-NR	G - Source unknown							
NBP 4	---	D	1921	SAINT JOHN	P/F-SR	P-SC-R	G - Source unknown							
PWC 1	---	W	1935	QUEENS	F/G-NR	P/F-NR	G - Source unknown							
PWC 2	---	HB	1921	MADAWASKA	G-NR	F-C-TR	G - Source unknown							
HB 1	---	W	Varies	SAINT JOHN	F/G-TR		G - Probably local							

KEY:

FIELD PERFORMANCE

Concrete Condition
P-Poor
F-Fair
G-Good

Evidence of Reaction

SR-Severe
IR-Intermediate
TR-Trace
NR-No Evidence
REP-Structure repaired
D-Structure demolished

CORE CONDITION

Concrete
P-Poor
F-Fair
G-Good

Cracking

SC-Significant
C-Cracking
MO-Minor
O-None

Evidence of Reaction

R-Cracks, rims, deposits
TR-Occ rims deposits
NR-No evidence

AGGREGATE

G-Gravel
R-Rock
C-Crushed

Type

HB-Highway bridge
RB-Railway bridge
W-Wharf
D-Dam
M-Monument

PETROGRAPHY
Aggregate Types

GR-Granite
LS-Limestone
S-Schist
G-Greywacke
A-Argillite
P-Phillite
V-Volcanics
MV-Meta Volcanics
C-Chert
QTZ-Quartzite
Q-Quartz
I-Igneous
MA-Marble
SS-Sandstone
F-Feldspar
M-Mica

Micro Cracking
P-Paste
A-Aggregate

Source

L-Probably local
I-Probably imported

Deposits

E-Ettringite
G-Silicagel

saG-Small amount of gel

TABLE 4.13
TABLE 4.3 (cont'd
DETAILS
OF STRUCTURES

structure would indicate. Distress and deterioration become less with increasing depth into the concrete. In about one-half of the cores recovered, the concrete was judged to be in better condition than indicated by surface appearance.

- structures were found in which cores revealed various portions had been built using different aggregates, and the field performance of the concrete was found to differ significantly in at least two of these cases.

- cases were identified where aggregates were found to have been imported over 250 km for construction. In five of the ten samples of hardened concrete examined petrographically, the aggregates were considered to have been imported. Thus, it certainly is not reasonable to assume that concrete structures were made with local aggregates unless actually documented.

- as noted in Dr. Gillott's report, the aggregate type most commonly associated with evidence of reaction in the concretes studied is greywacke, followed by argillites, phyllites, chert and some granites.

The significance of the aggregate types identified with alkali-aggregate reactions will be clarified in Section 5 which discusses the petrography of typical concrete aggregates used in the Province both at present and in the past.

From a review of the information presented in Figure 4.7 it would appear that aggregates may not be the only factor in deterioration due to aggregate reactions. The fact that there are multiple peaks over time in the percentage of structures affected argues that the alkalis available to cause reactions has varied over the years. Variations in alkali content of New Brunswick produced cements are documented, ranging from a low of 0.7 percent to a high of 1.0 percent, over the period 1952-83. Variations in alkali contents prior to 1952 are unknown, but probably varied as much or more. As well, usage of deicing salts starting in the 1950s may have contributed to the problem through increased alkali availability and certainly by accelerating deterioration of concrete made vulnerable to penetration of aggressive solutions by cracking induced by aggregate reactions.

5.0 AGGREGATE SAMPLING AND PETROGRAPHY

5.1 Geology

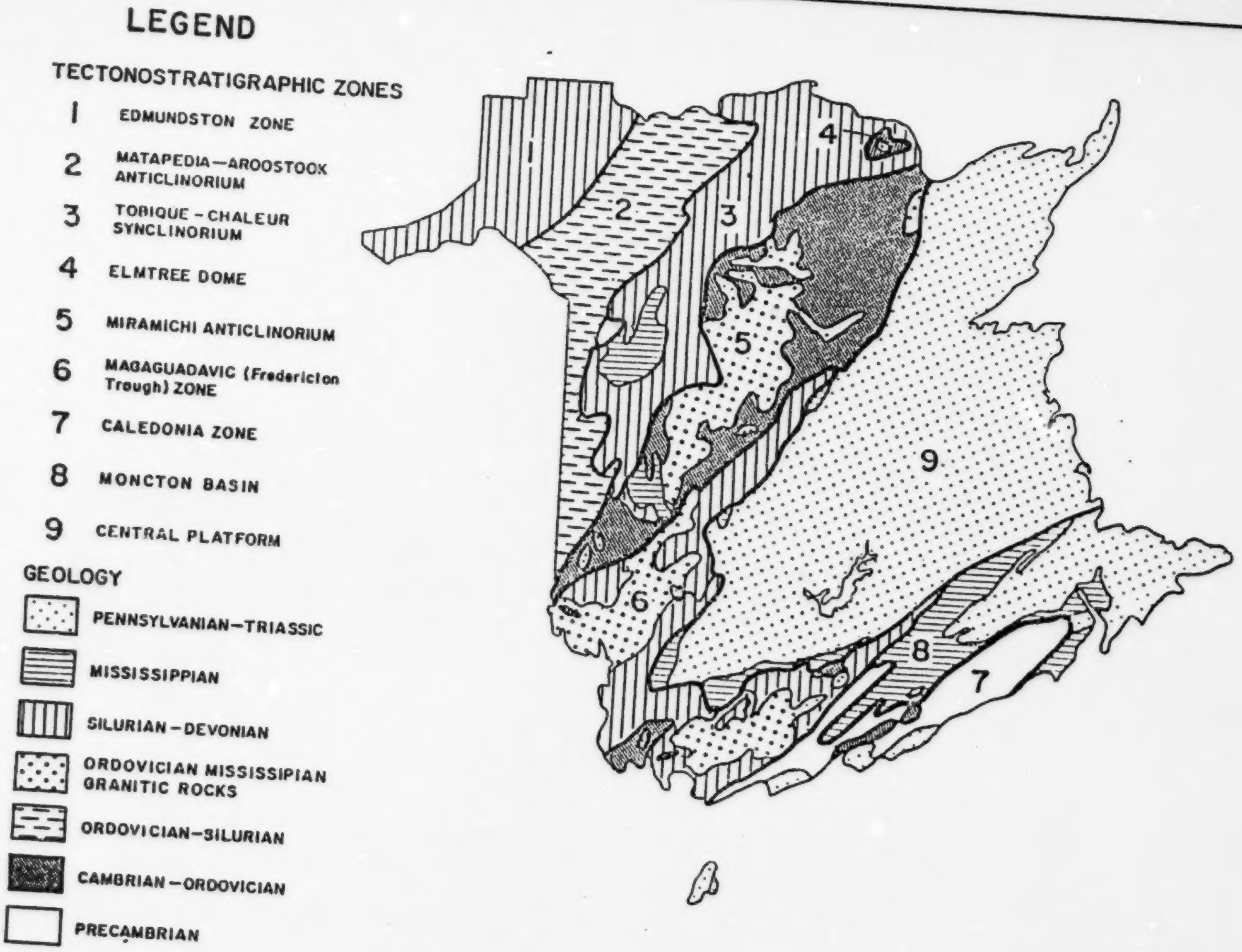
New Brunswick is located within the Appalachian Region of Canada and, as such, both the physiographic and the major geologic zones parallel the northeast to southwest Appalachian trend (Figure 5.1). The Miramichi Belt follows this alignment; this belt being a lens-shaped strip of Ordovician sediments and volcanics intruded by Devonian granite extending from McAdam northeast to Bathurst.

North and west of the Miramichi Belt is the Matapedia Belt which consists of a central anticlinorium of Ordovician/Silurian calcarious sediments flanked by younger Silurian to Devonian rocks; also of sedimentary origin.

South of the Miramichi Belt is a broad triangular shaped trough infilled with the relatively young Carboniferous sandstones which cover perhaps one-third of the Province. These sediments are fringed to the west and south by older rocks of the Fredericton and Avalon Belts, respectively. The Fredericton Belt comprises Silurian greywackes and other sediments intruded by Devonian granite. The Avalon Belt extends along the full length of New Brunswick's Bay of Fundy shoreline and is made up of Precambrian rocks of all types.

As one would expect, the petrography of the sand and gravel deposits is closely related to bedrock type.

Petrographic data from eight map sheets, as mapped and described by the Department of Natural Resources, were evaluated. The locations of the map areas are shown in Figure 5.2. The purpose


LEGEND
TECTONOSTRATIGRAPHIC ZONES
1 EDMUNDSTON ZONE
2 MATAPEDIA—AROOSTOOK ANTICLINORIUM
3 TOBIQUE - CHALEUR SYNCLINORIUM
4 ELMTREE DOME
5 MIRAMICHI ANTICLINORIUM
6 MAGAGUADAVIC (Fredericton Trough) ZONE
7 CALEDONIA ZONE
8 MONCTON BASIN
9 CENTRAL PLATFORM
GEOLOGY
PENNSYLVANIAN—TRIASSIC
MISSISSIPPIAN
SILURIAN - DEVONIAN
ORDOVICIAN MISSISSIPIAN GRANITIC ROCKS
ORDOVICIAN—SILURIAN
CAMBRIAN—ORDOVICIAN
PRECAMBRIAN
1
2
3
4
5
6
7
8
9

GENERAL GEOLOGY OF NEW BRUNSWICK

SOURCE: QUATERNARY GEOLOGY OF NEW BRUNSWICK, RAMPTON ET AL., GEOLOGICAL SURVEY OF CANADA, 198

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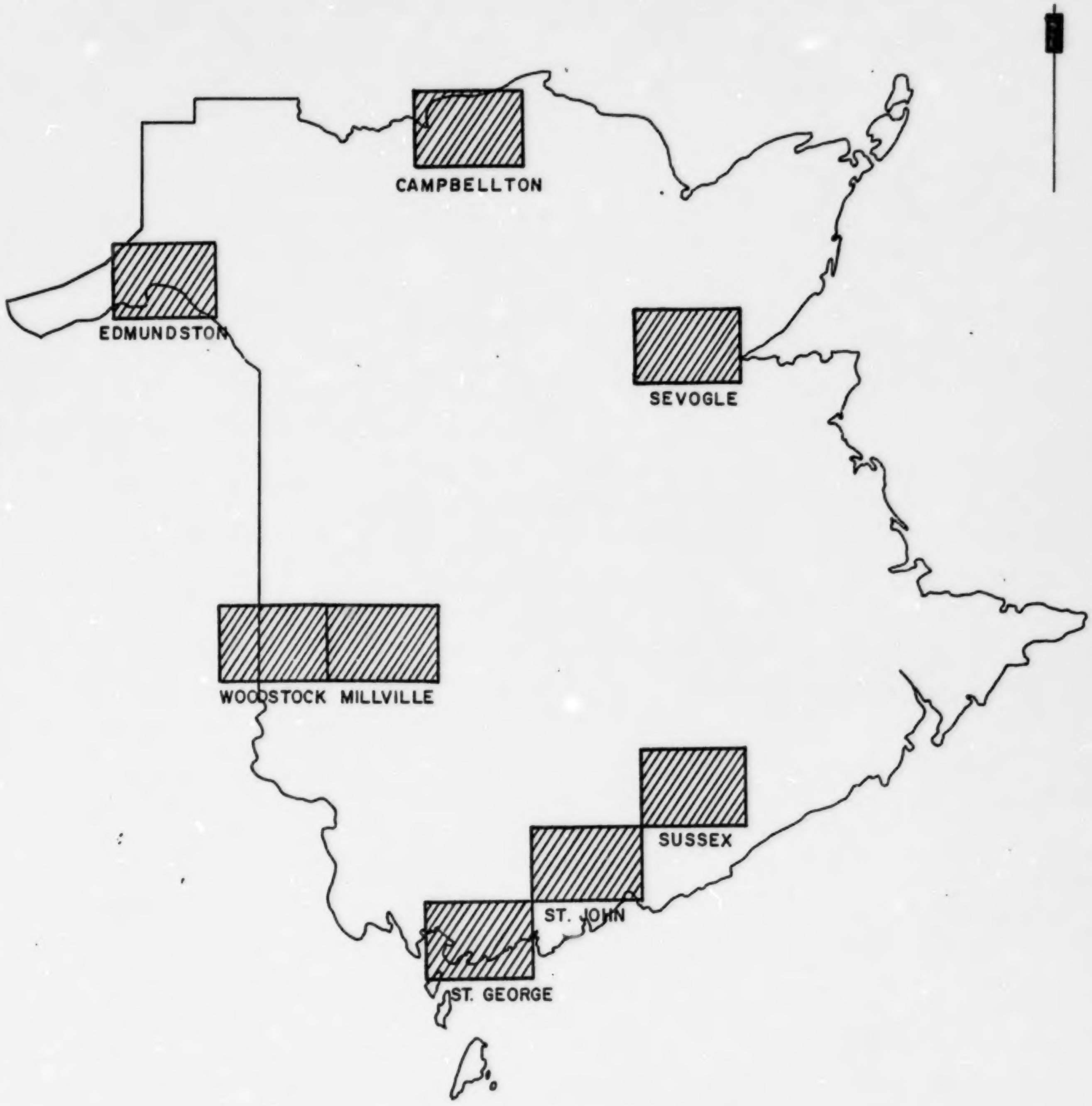
Dwg. FIGURE 5.1

Drn. By	Scale	Date
B.R.C.		03/


CAMPBELLTON
EDMUNDSTON
SEVOGLE
WOODSTOCK
MILLVILLE
SUSSEX
ST. JOHN
ST. GEORGE

LOCATION OF MAP SHEETS FOR WHICH EXISTING PETROGRAPHY OF SANDS AND GRAVELS WAS REVIEWED

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Dwg. FIGURE 5.2

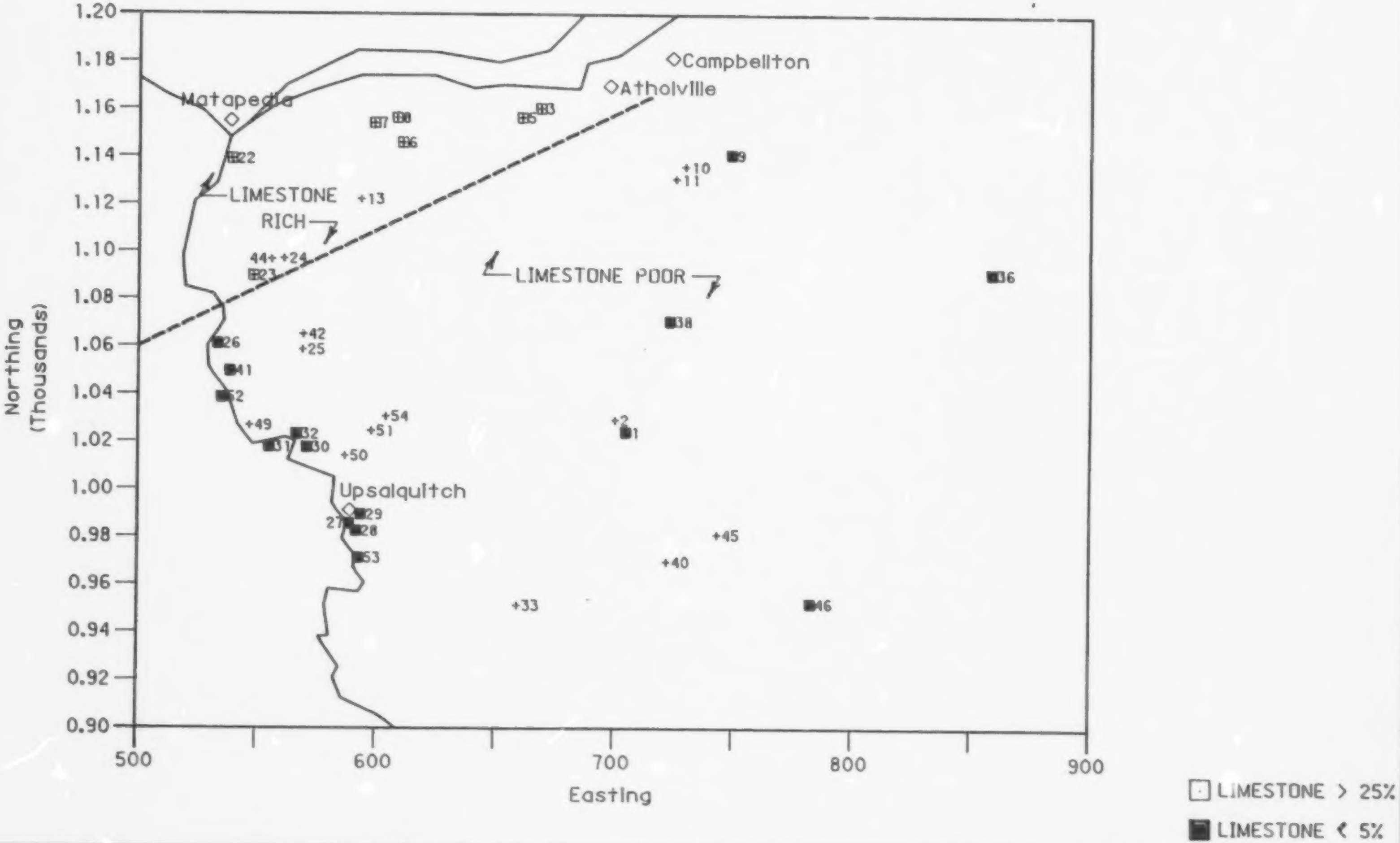
Drn. By	Scale	Date
P.R.C.	—	03/88

of this work, focusing primarily on the surficial sand and gravel resource, was to assess the variability of aggregate petrography within a given map area. Different petrographers carried out the work, generally without resort to examination of thin sections, with the result that some overlap of rock groupings occurs, particularly for those rock types most difficult to identify in hand specimen. Nevertheless, the petrographic data, summarized in Table 5.1., are of interest.

The association between bedrock type and aggregate composition is marked. Limestone, for example, appears in sands and gravels in the Campbellton, Woodstock and Millville areas; these being "down-ice" from the 40 kilometre wide band of Ordovician and/or Silurian calcarious sediments. Limestones are absent elsewhere. On a smaller scale, the association can be even more marked. In the Campbellton map sheet, for example, shown in Figure 5.3, a line can be drawn from the junction of the Restigouche and Upsalquitch Rivers (at Robinsonville) to Campbellton. North of this line, limestones make up more than 25 percent of the gravel sizes in the surficial deposits. South of the line, gravels contain less than 5 percent limestone.

A similar correspondence between bedrock geology and aggregate petrography is evident when one examines the distribution of granite pebbles in the sand and gravel deposits. In this case, at least five granite bedrock sources across the Province have apparently contributed. About one quarter of the pebbles from gravels in the Saint John and St. George map areas were of coarse grained igneous intrusive type. In the St. George area, (Figure 5.4), these intrusives are principally granites, presumably derived from the 1000 square kilometre outcrop of Devonian granite which occupies the eastern half of Charlotte County. South of Highway 1, aggregates comprise less than 10 percent intrusives. North of the highway, the proportion of intrusives increases, and locally the granite content exceeds 50 percent.

GRANULAR RESOURCES
Campbellton Map Sheet


Northing (Thousands)
1.20
1.18
1.16
1.14
1.12
1.10
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
0.90
Easting
500
600
700
800
900
Campbellton
Atholville
Matapedia
Upsalquitch
LIMESTONE RICH
LIMESTONE POOR
3
5
7
8
6
22
13
24
44
23
9
10
11
36
38
42
25
26
41
52
49
32
31
30
54
51
50
2
1
29
27
28
53
45
40
33
46
LIMESTONE > 25%
LIMESTONE < 5%

AGGREGATE PETROGRAPHY - CAMPBELLTON MAP AREA

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Dwg.	FIGURE 5.3	
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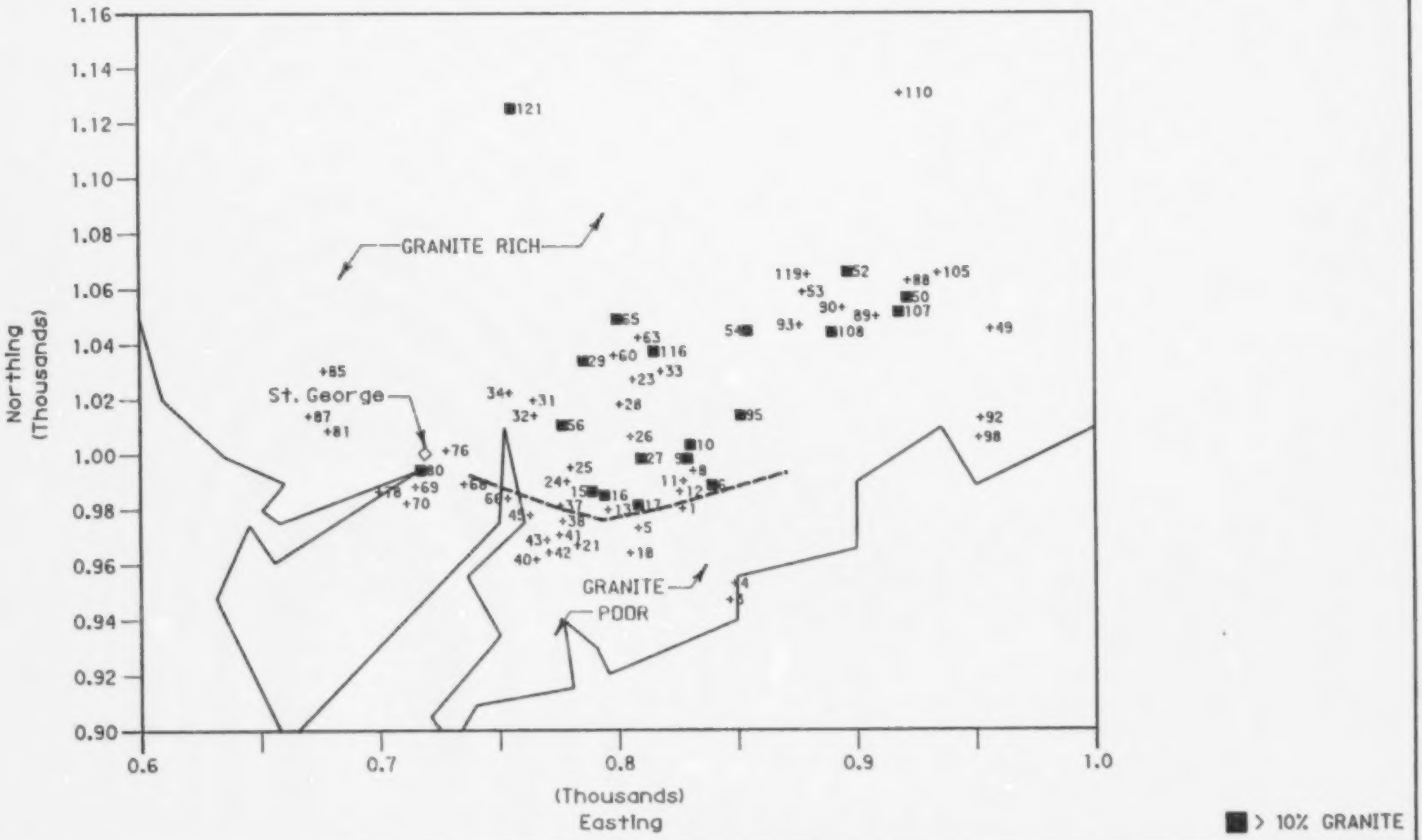
GRANULAR RESOURCES

St. George Map Sheet



AGGREGATE PETROGRAPHY - ST. GEORGE MAP AREA

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Dwg.	FIGURE 5.4	
Drn. By H.M.	Scale N.T.S.	Date 12/89

TABLE 5.1

SUMMARY OF PETROGRAPHIC DATA - SAMPLES FROM GRAVEL PITS LOCATED IN EACH OF EIGHT MAP AREAS

(BASED ON ANALYSES BY THE NEW BRUNSWICK DEPARTMENT OF NATURAL RESOURCES)

	Sevogle	Campbellton	Edmundston	Sussex	St. John	St. George	Woodstock Millville
Good Aggregate							
Quartz, Quartzite	31.6	1.2	5.8	9.1	12.4	25.7	11.7
Volcanics	5.7	9.5	0.1	35.5	45.7	37.8	7.2
Intrusives	16.4	5.2	0.4	5.0	25.6	23.6	10.6
Metavolcanics/ Metaseds	15.9	-	-	-	-	-	16.5
Sandstone-siltstone	-	30.7	-	-	-	-	20.2
Limestone	-	12.2	-	-	-	-	3.4
Greywacke	-	-	3.6	-	-	-	-
Other good	1.0	7.8	-	-	0.3	-	1.6
Poor Aggregate							
Shale/schist/ friable	11.6	11.3	-	5.5	3.5	6.4	9.9
Sandstone-siltstone	14.4	5.9	39.5	35.1	7.2	5.0	3.8
Greywacke	-	-	2.8	-	-	-	2.8
Soft, weathered	3.4	12.1	2.8	5.2	3.7	1.0	7.6
Slate	-	2.1	44.3	-	-	-	-
Other poor	-	2.0	0.7	4.6	1.6	0.5	7.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0

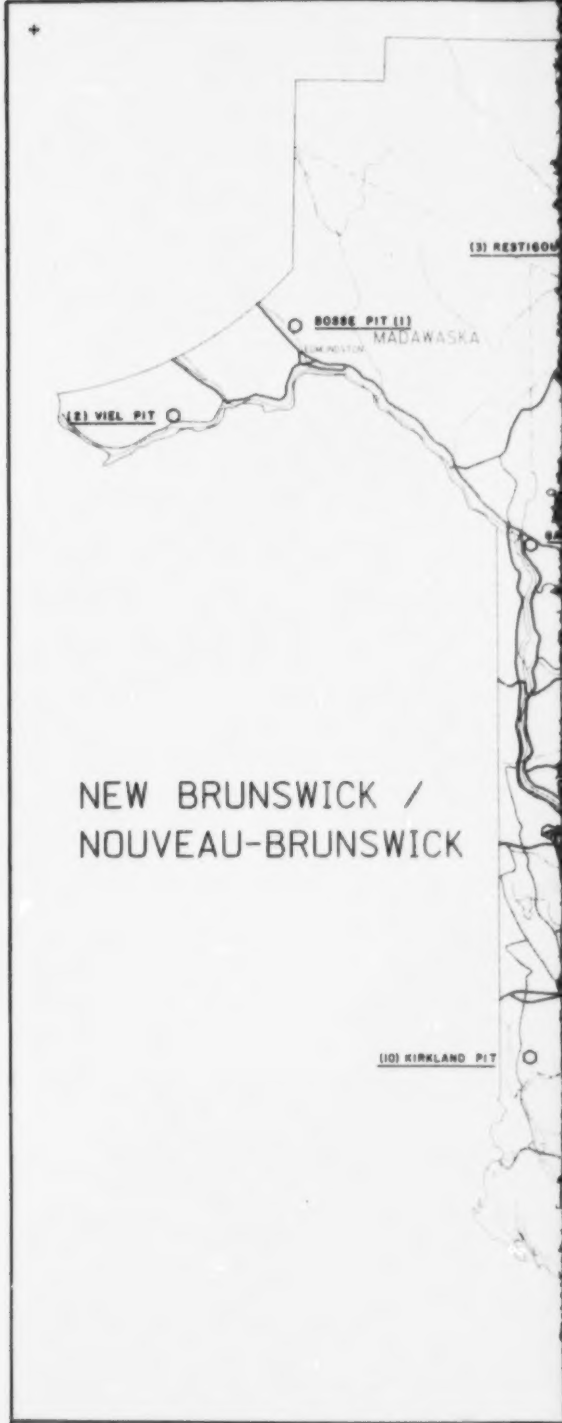
The fine grained sediments and metasediments which are represented in the sand and gravel deposits cannot be so readily linked to a particular bedrock source. This is attributed to two main factors. Firstly, the sedimentary origin of the parent rock leads to considerable heterogeneity; that is to say variations occurring in lithology from one bed to the next. Secondly, these rocks are often more difficult to consistently identify in hand specimen than are coarser grained rocks where constituent minerals can be seen with the naked eye. This is unfortunate because included in this sedimentary group are the broad range of argillites, meta argillites and greywackes - some of which have doubtless been associated with adverse reactions in concrete.

5.2 Current and Past Production Sources

5.2.1 Sampling

Sources of concrete aggregate presently in use or utilized in the past were sampled and examined petrographically. The 32 sample locations are shown in Figure 5.5. Most of these samples were sands and gravels, but several rock sources were also included. Samples were obtained in accordance with the requirements of CSA A23.2-M77.

Where possible, samples were obtained from stockpiles which had been processed for concrete production. Details of sampling procedures and grain size analyses of the various materials are presented in Appendix E. Tables 1, 2, 3, 4 and 5 in that Appendix contain proportions of each fraction in any given sample, expressed in weight percentages. The fractions selected for the petrographic examination are indicated in the same tables.



(3) RESTIGOU
BOSSE PIT (1)
MADAWASKA
EDMUNDSTON
(2) VIEL PIT
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK
(10) KIRKLAND PIT

STUDY OF THE ALKALI REACTIVITY

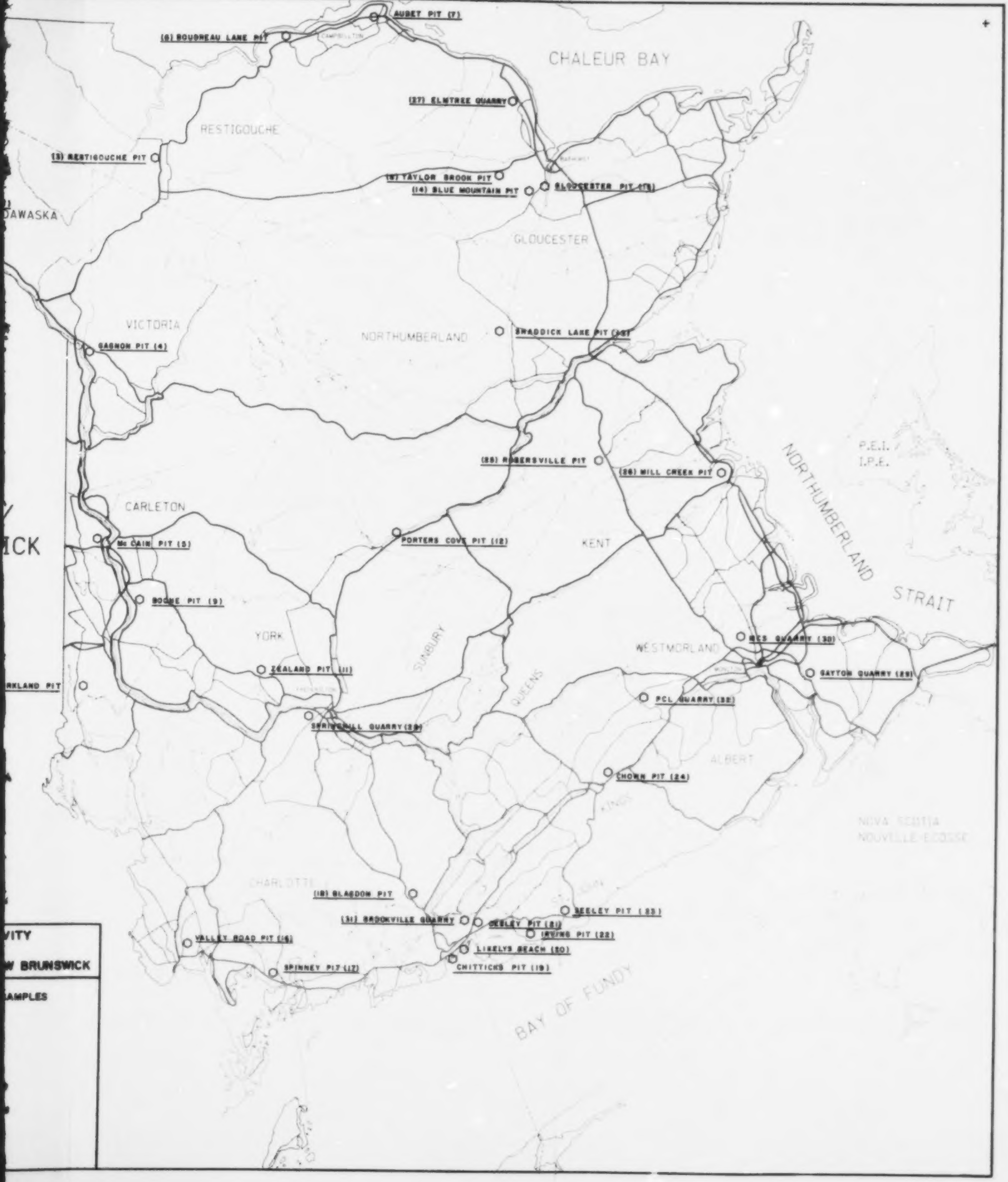
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

FIGURE 5.5 LOCATION OF 32 AGGREGATE SAMPLES

LEGEND

○........ LOCATION OF AGGREGATE SAMPLES
(1)........ PIT OR QUARRY IDENTIFICATION NUMBER

1884 - 30 / P-100

AUBET PIT (7)
(6) BOUDREAU LANE PIT
CAMPBELLTON
CHALEUR BAY
(27) ELMTREE QUARRY
RESTIGOUCHE
(3) RESTIGOUCHE PIT
BATHURST
(8) TAYLOR BROOK PIT
(14) BLUE MOUNTAIN PIT
GLOUCESTER PIT (15)
DAWASKA
GLOUCESTER
VICTORIA
NORTHUMBERLAND
SWADDICK LAKE PIT (10)
GAGNON PIT (4)
(25) ROGERSVILLE PIT
(26) MILL CREEK PIT
P.E.I.
I.P.E.
NORTHUMBERLAND STRAIT
CARLETON
ICK
Mc CAIN PIT (5)
PORTERS COVE PIT (12)
KENT
BOONE PIT (9)
YORK
SUNBURY
RCS QUARRY (30)
WESTMORLAND
MONCTON
GAYTON QUARRY (29)
ZEALAND PIT (11)
RKLAND PIT
FREDERICTON
QUEENS
PCL QUARRY (32)
SPRINGHILL QUARRY (28)
ALBERT
CHOWN PIT (24)
KINGS
NOVA SCOTIA
NOUVELLE-ÉCOSSE
CHARLOTTE
(18) GLAGDON PIT
SAINT JOHN
SEELEY PIT (23)
(31) BROOKVILLE QUARRY
SEELEY PIT (21)
IRVING PIT (22)
VALLEY ROAD PIT (16)
LISELYS BEACH (20)
SPINNEY PIT (17)
CHITTICKS PIT (19)
BAY OF FUNDY
VITY
W BRUNSWICK
AMPLES

The samples were split down into individual fractions by sieving. Selected fractions were then examined petrographically using ASTM C-295 procedures. Table 5.2 shows the number of samples examined in each size fraction and also the petrographic technique employed.

A total of 187 size fractions were examined from the 32 samples.

The detailed results of the petrographic examination are reported in Appendix E in 127 tables that are organized alphabetically by sample. The tables for the stone fractions contain names of the types of rocks identified in a given fraction plus their abundances and textural features, reported as the number of the grains counted. The tables for the sand fractions have names of the rock types and their abundances in a given fraction. The results of qualitative examination of the pan fractions are listed in the tables which contain the results of examination of the fractions Ret. #30 and Ret. #100 in a particular sample. Explanations of some petrographic terms that may be found in the tables are compiled in a vocabulary included in Appendix E.

Forty-six photomicrographs documenting the presence and the mode of occurrence of the cryptocrystalline silica and strained quartz either as components of some rocks or as individual grains have been taken. The photomicrographs included in Appendix E are organized by deposit in alphabetical order. Explanations to the photomicrographs are also included.

TABLE 5.2

SUMMARY OF PETROGRAPHIC TECHNIQUES EMPLOYED FOR THE EXAMINATION OF VARIOUS SIZE FRACTIONS

KEY: 8 (4.3) Number and (percentage) of total samples analyzed in each fraction

	SIZE FRACTION			PETROGRAPHIC TECHNIQUE
	Sand		Stone	
		3/4	7 (3.7)	macroscopic examination, microscopic examination of thin sections produced from most abundant types of rocks
		1/2	27 (14.4)	macroscopic and stereomicroscopic examination, microscopic examination of thin sections produced from most abundant types of rocks
		3/8	23 (12.3)	macroscopic and stereomicroscopic examination
		#4	4 (2.1)	stereomicroscopic examination
	8 (4.3)	#8		stereomicroscopic examination
	25 (13.3)	#16		stereomicroscopic examination
	31 (16.6)	#30		microscopic examination of thin sections produced from grain mounts
	31 (16.6)	#100		microscopic examination of thin sections produced from grain mounts
	31 (16.6)	PAN		X-ray diffraction on oriented samples
Subtotal	126 (67.4)		61 (32.6)	
Total		187 (100)		

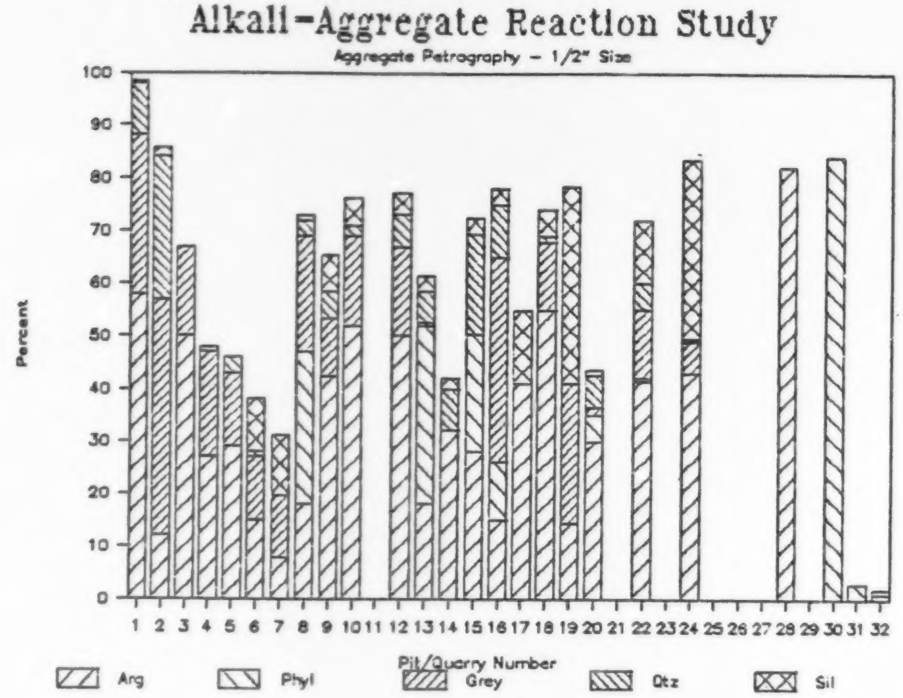
Note:

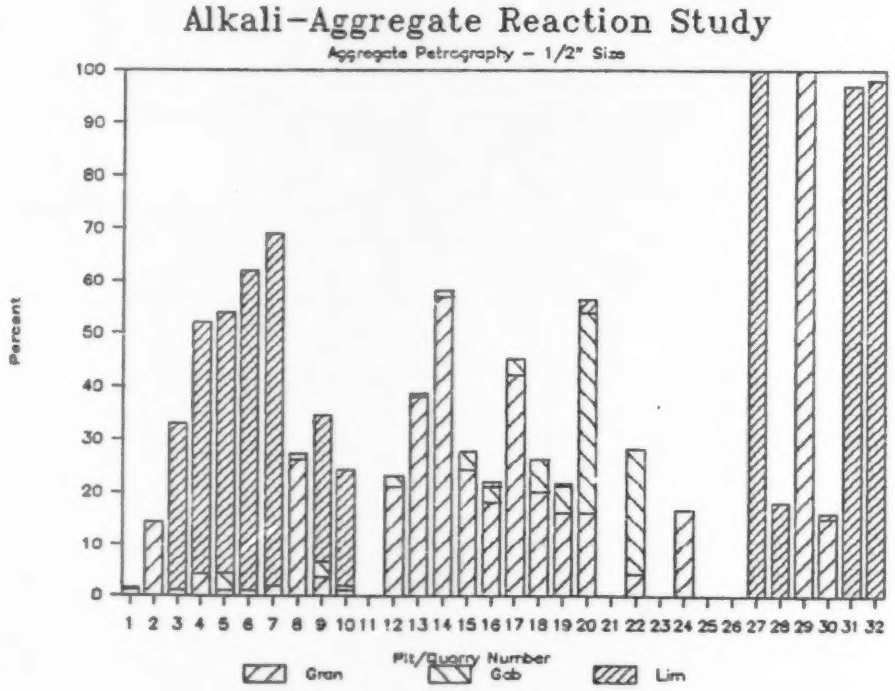
Approximately three hundred rock/mineral particles from selected stone and sand fractions were examined macroscopically and microscopically. Mineral composition of the pan fractions was determined by X-ray diffraction performed on oriented samples. The oriented samples were prepared by sedimentation of the pan fractions on glass slides.

5.2.2 Petrography

Figures 5.6 and 5.7 show the petrography of the ½" and 3/8" size aggregates. Figure 5.8 gives the results of a combined sample obtained by weighting the results of the ½" and 3/8" analyses according to the 63-37 split one would expect in concrete aggregate. For each figure, the upper graph shows five rock groupings initially considered to be potentially deleterious as discussed in Section 3.3. The lower graph gives the percentage of pebbles falling into each of three other groups considered likely to be innocuous. For a given Pit/Quarry number, the sum of potentially reactive and innocuous components is 100 percent. The rock groupings are listed in Table 5.3 which also shows the prevalence of each group as represented in samples from the 32 localities. It is apparent from examination of these figures and tables that a significant proportion of New Brunswick aggregates consist of rock types which have been found in other jurisdictions to be potentially deleterious.

The subdivision of these aggregate data into the eight groupings referred to above was only meaningful for sizes larger than 3/8 inch. At smaller sizes, an increasing proportion of the aggregate comprises individual minerals rather than rock fragments, and where this occurs, the parent rock type may be a matter of conjecture. Nevertheless, examination of Figures 5.6, 5.7 and 5.8 is of interest. The presence, indeed prevalence of limestones in Pits 3 through 10 and of granites in Pits 12 through 20, for example, confirms the close relationship between bedrock and surficial geology; that transportation distances have therefore been relatively short.





AGGREGATE PETROGRAPHY
1/2" SIZE

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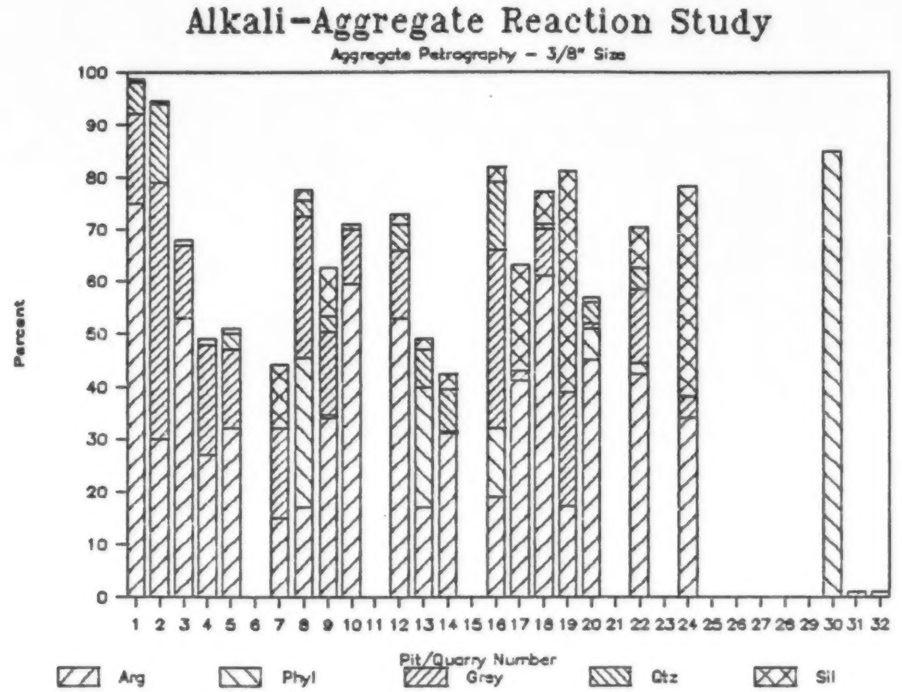
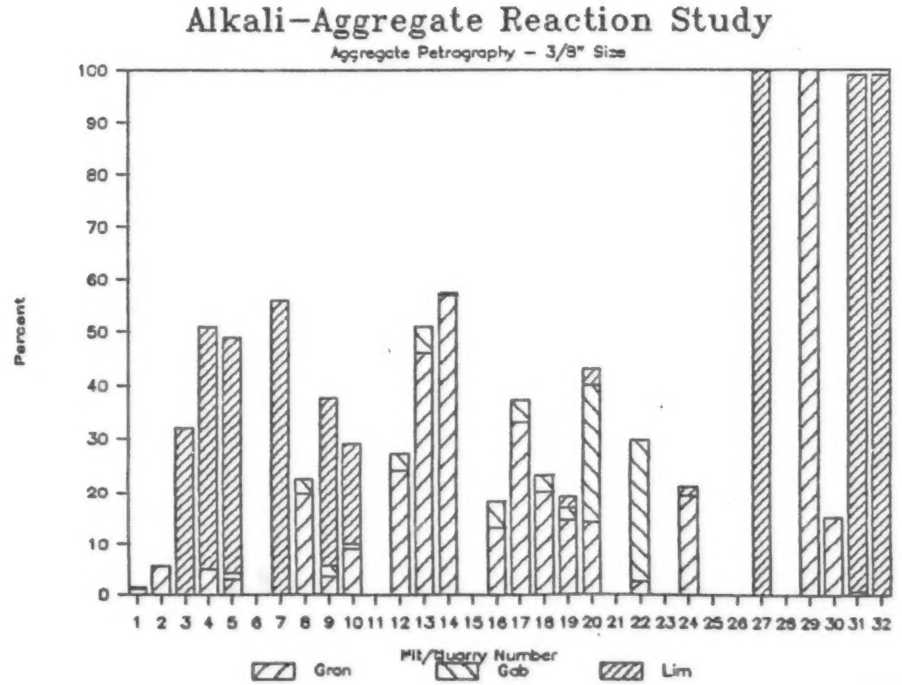
Dwg. FIGURE 5.6

Drn. By	Scale	Date
P.R.C.	—	03/88

AD1106 94 04





AGGREGATE PETROGRAPHY
3/8" SIZE

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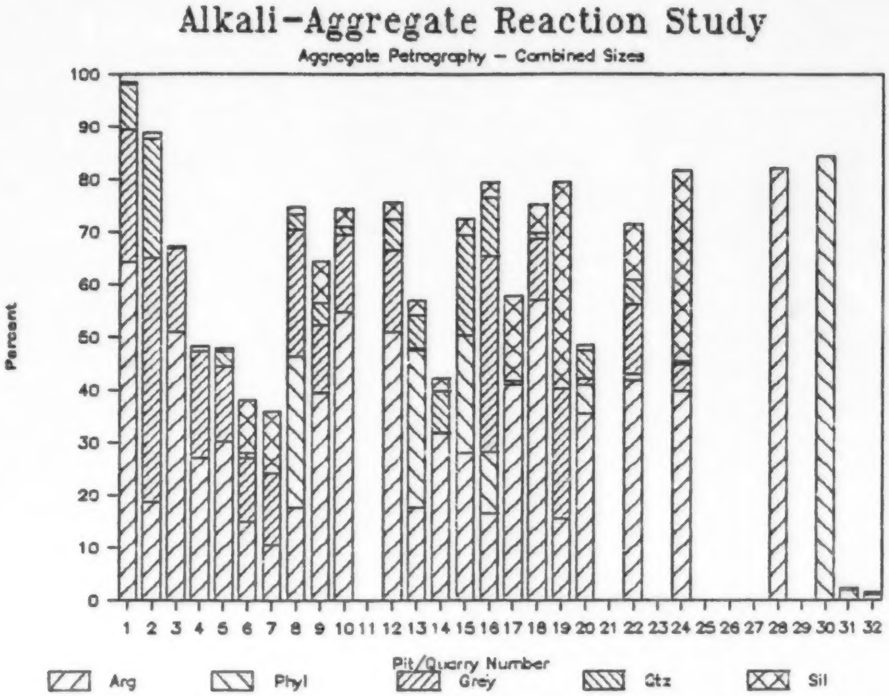
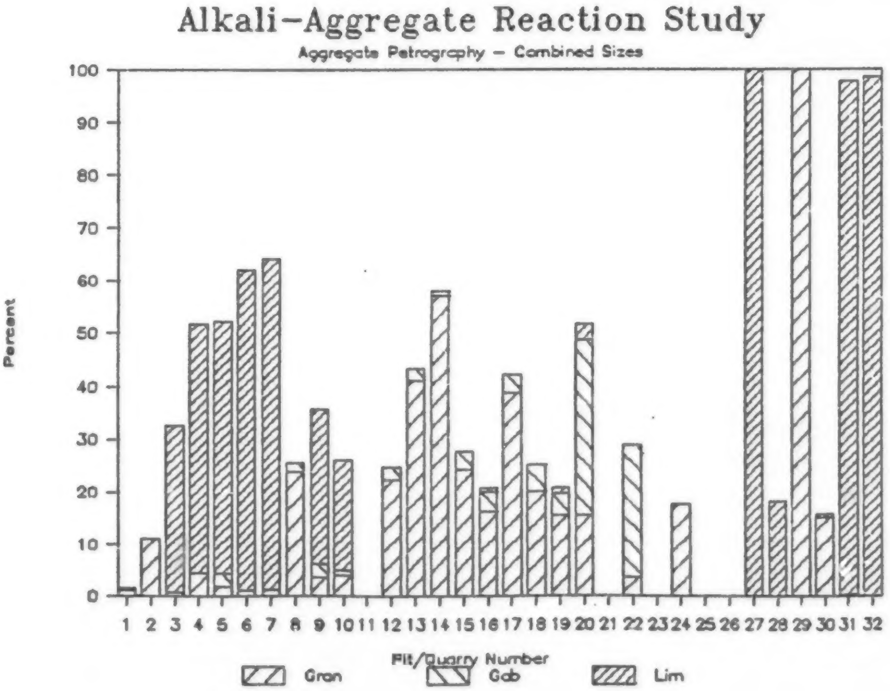
Project 1264 - 30		
Dwg. FIGURE 5.7		
Drn. By P.R.C.	Scale —	Date 03/88





AGGREGATE PETROGRAPHY
COMBINED SIZE

ADI Limited
Engineering Architecture Planning
Management Consulting Surveying
(506) 452-9000
Suite 407, 1133 Regent Street
Fredericton, NB Canada

Project	1264 - 30	
Dwg.	FIGURE 5.8	
Drn. By	Scale	Date
P.R.C.	—	03/88

AD1106 94 04

TABLE 5.3

CONSTITUENTS OF NEW BRUNSWICK AGGREGATES BY ROCK GROUP

Group Number	Rock Types	Prevalence	
		[a]	[b]
1	Argillite, Meta agrillite (Slate, shale) [c]	21	85
2	Phyllite, Schist	6	60
3	Greywacke, Metagreywacke (Lithic Wacke, Metawacke) [c]	13	81
4	Quartzite (Quartzwacke) [c]	5	65
5	Silicified volcanics, Silica lavas, Rhyolite, Chalcedony, Chert	6	79
8	Granite, Syenite, Granodiorite, Granitoid	29	90
9	Gabbro, Basalt, Gneiss, Greenstone [d]	3	56
10	Limestone, Dolomite	16	48

Notes:

[a] Overall abundance at 32 localities (26 pits and 6 quarries)

[b] Percentage of the 154 size fractions analyzed (from the 32 localities) where this group occurred

[c] DNR preferred group name

[d] DNR suggests gneiss be moved to group 8.

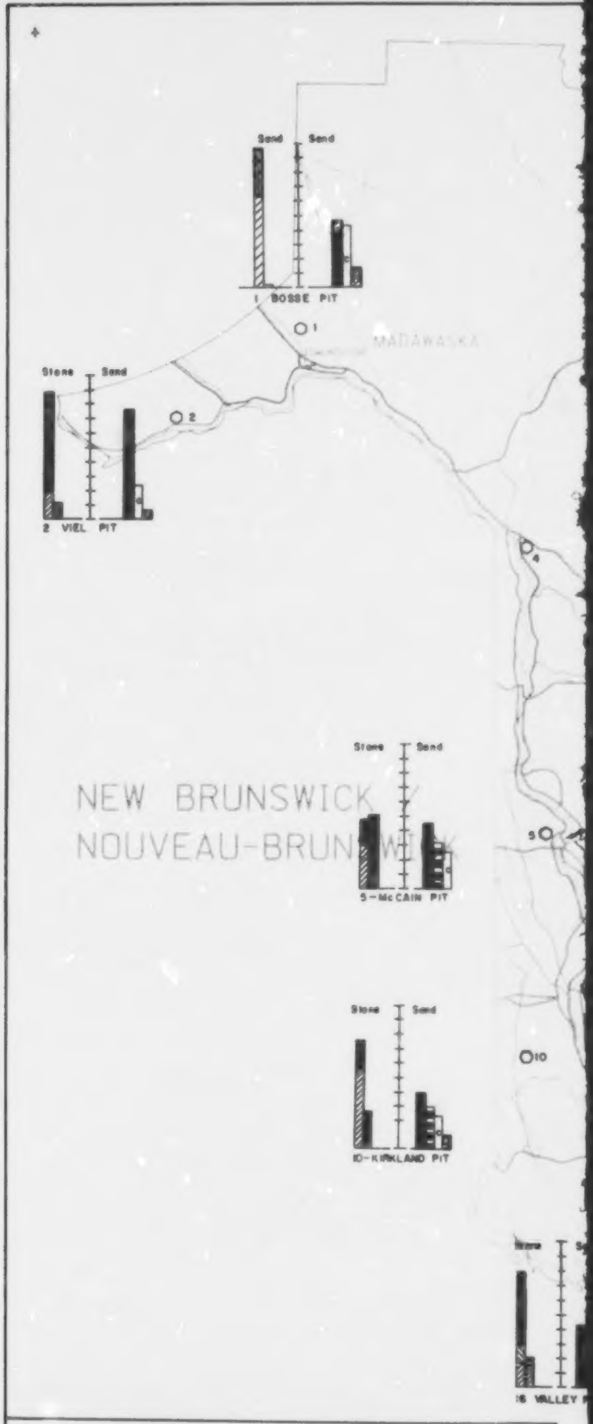
5.3 Summary of Aggregate Petrography

Figure 5.9 shows the aereal distribution of various rock types, as they appeared in the sampled pits and quarries. For the stone sizes, the bar charts represent the percentages of each of the rock groups present, calculated for a combined sample of ½" and 3/8" aggregate, as shown earlier in Figure 5.8. For the sand sizes, the parent rock types may be indeterminate, and the bar charts reflect subdivision into the following four categories based on rock type and mineral assemblage.

1. Sedimentary rocks, their metamorphic equivalents, volcanogenic rocks containing microcrystalline quartz or cryptocrystalline silica.
2. Carbonaceous rocks.
3. Quartz, feldspar, other minerals, igneous rocks, basic volcanogenic rocks and their metamorphic equivalents.
4. Cryptocrystalline silica, strained quartz.

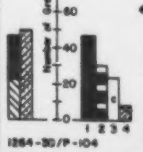
The marked connection between bedrock type and aggregate composition discussed earlier (Section 5.1) is confirmed. The distribution of the various rock types in the surficial gravels is illustrated in a series of maps presented in Appendix E.

A large percentage (typically 40 to 100 percent) of the rock types which make up the natural gravels would normally be considered as potentially deleterious. The major potentially deleterious types by far, are the argillites and greywackes which predominate in the far northwest and south of the Province, where they account for as much as 50 to 90 percent of the total aggregate.


Sand
Sand
1 BOSSE PIT
1
MADAWASKA
Stone
Sand
2
2 VIEL PIT
4
Stone
Sand
NEW BRUNSWICK
NOUVEAU-BRUNSWICK
5
5-McCAIN PIT
Stone
Sand
10
10-KIRKLAND PIT
Stone
16 VALLEY

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

FIGURE 5 9 AERIAL DISTRIBUTION OF ROCK TYPES IN SAMPLED PITS AND QUARRIES



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SAND

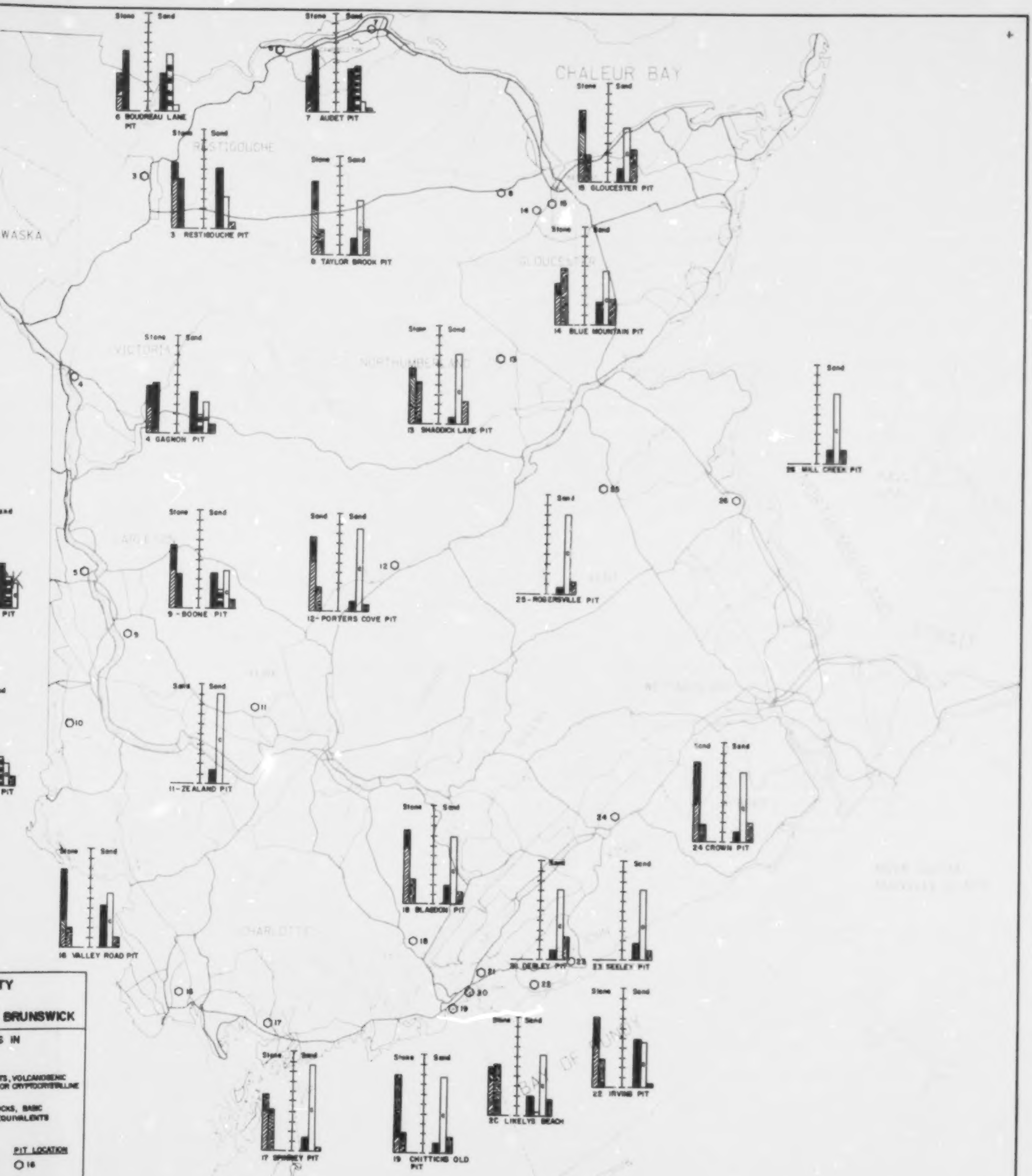
1. SEDIMENTARY ROCKS, THEIR METAMORPHIC EQUIVALENTS, VOLCANOGENIC ROCKS CONTAINING MICROCRYSTALLINE QUARTZ OR CRYPTOCRYSTALLINE SILICA
2. CARBONACEOUS ROCKS
3. QUARTZ, FELDSPAR, OTHER MINERALS, IGNEOUS ROCKS, BASIC VOLCANOGENIC ROCKS AND THEIR METAMORPHIC EQUIVALENTS
4. CRYPTOCRYSTALLINE SILICA, STRAINED QARTZ

STONE

- ▨ ARGILLITE
- ▨ PHYLLITE
- ■ GREYWACKE
- ■ QUARTZ
- ▩ SILIC VOLC
- ▨ GRANITE
- ▨ GABBRO
- ▦ LIMESTONE

PIT LOCATION

○ 16



CHALEUR BAY
RESTIGOUCHE
WASKA
GLOUCESTER
VICTORIA
NORTHUMBERLAND
CARLETON
CHARLOTTE
BAY OF FUNDY
Stone
Sand
6 BOUDREAU LANE PIT
7 AUBET PIT
3 RESTIGOUCHE PIT
8 TAYLOR BROOK PIT
15 GLOUCESTER PIT
14 BLUE MOUNTAIN PIT
4 GAGNON PIT
13 SHADDICK LAKE PIT
26 MILL CREEK PIT
9 - BOONE PIT
12 - PORTERS COVE PIT
25 - ROGERSVILLE PIT
11 - ZEALAND PIT
24 CROWN PIT
16 VALLEY ROAD PIT
18 BLAGDON PIT
20 DEBLEY PIT
23 SEELEY PIT
22 IRVING PIT
2C LIKELYS BEACH
17 SPINNEY PIT
19 CHITTICKS OLD PIT
TY
BRUNSWICK
S IN
TS, VOLCANOGENIC
OR CRYPTOCRYSTALLINE
OCKS, BASIC
EQUIVALENTS
PIT LOCATION
16

5.3.1 Slate/Argillite

The coarse fraction of each recovered sample of natural sand and gravel contained at least 10 percent slate/argillite. These rock types were prevalent in the central and western part of the Province, making up more than 50 percent of the pebble fractions or sizes in the Viel, Restigouche, Porter's Cove, Kirkland and Blagdon Pits. In the north of the Province, and in certain pits along the south coast, the slate/argillite group was less well represented.

5.3.2 Phyllite/Schist

Phyllites and schists were practically absent from the coarse fractions of sampled gravels except for a group of pits in the Bathurst to Newcastle area and for single pits near St. Stephen (Valley Road) and Saint John (Likely's Beach).

5.3.3 Greywacke

The distribution of greywackes among the pebble sizes of the sampled natural gravels was somewhat sporadic, although this rock type was represented at all but five locations. It was absent at 3 pits near Bathurst-Newcastle, and from the Spinney and Likely's Beach pits on the south coast.

Greywackes were of prime importance in the Viel Pit at the northwest tip of the Province, and in the Valley Road Pit near St. Stephen.

Considered together, as they are often associated in outcrop, the greywacke/argillite rock types represent more than 50 and up to 90 percent of gravel sizes in pits located in the northwest and in the central-southwest of the Province. Argillites and greywackes are less abundant in pits located along the north shore and in the Newcastle area.

5.3.4 Quartzite

Quartzites were not major contributors to the sampled gravel deposits--only in four cases constituting more than 10 percent of the aggregate petrography. These four pits were the Viel and Bosse pits northwest of Edmundston; the Gloucester Pit near Bathurst; and the Valley Road Pit near St. Stephen.

5.3.5 Lava and Tuff

This rock group, comprising acid volcanic lavas and tuffs, has historically been linked to aggregate reaction problems. The distribution of these rock types in the natural gravels was therefore of particular interest.

Three areas can be identified where lavas and tuffs of this kind are more numerous in the natural gravels. Along the Province's north shore, approximately 10 percent of the coarse aggregate sizes were made up of these volcanics. In the Sussex area, the Chown Pit contained 38 percent silicic and silicified volcanogenic pebbles. Along the south coast, 3 of the 6 sampled pits contained more than 10 percent of this material and, in one pit, Chitticks Old (McNaulty) Pit, the percentage was 38.

The trend noted above is also reflected in Table 5.1 (under Volcanics), which was based on analysis of a much larger number of samples.

5.3.6 Granite

Granitic pebbles are abundant in those pits located in a northeast to southwest band running from Bathurst to St. Stephen; this being immediately down-ice from the Devonian granite intrusions. At St. Stephen, the band swings eastwards to Saint John. Within the "granite rich" zone, at least 15 percent and up to 58 percent of the pebbles are granites. Outside this zone, for example in those pits bordering the Saint John River Valley north of Meductic, granites are practically absent.

The trend appears to be a consistent one; strongly supporting the conclusion that the granite-rich aggregates in the hardened concrete of some of the existing structures located outside the "granite" zone have probably been imported.

5.3.7 Gabbro/Basalt

The basic igneous rock types are not well represented in New Brunswick's bedrock geology nor in the surficial sands and gravels. Only in two of the sampled pits were these rocks of major importance; these being the Likely's Beach and Irving Pits in Saint John. In these pits, meta-basic volcanogenic rocks constituted approximately 34 and 25 percent of the coarse aggregate sizes, respectively. The coarser grained intrusive gabbros are practically absent.

5.3.8 Limestone, Dolomite

The pronounced association between limestone bedrock geology and limestone constituents in natural gravels was illustrated, for the Campbellton map area, in Section 5.1. On a broader scale, the limestones occur in the surficial gravels almost exclusively in those pits located from Campbellton down to Woodstock and Millville, down-ice from the Ordovician/Silurian band of limestone bedrock.

The presence of limestones in concrete structures located far from the limestone bedrock, again suggests importation of these aggregates.

5.4 Aggregate Selection for Test Programme

It was resolved, in consultation with CANMET, that the bulk of the aggregate testing for potential alkali reaction would be conducted on samples collected from bedrock sources.

While this approach would result in some of the currently utilized aggregates being omitted from the physical testing programme, it was reasoned that this disadvantage would be outweighed by the potential benefits. Testing of a sample comprising coarse aggregate from a single bedrock source should allow a fair assessment to be made of that individual rock material. This information could then be used with a reasonable degree of confidence to assess the probable performance of a wide variety of aggregate sources based on the rock types contained and a comparison with the performance of the test rock types.

In addition, it was decided to select a limited number of natural sand and gravel aggregates for testing, that represent, petrographically, rocks from sources currently in use or known to have been used in the past.

In all, twenty-five basic rock types, eight natural gravels and fifteen natural sands were selected for testing as discussed in the following subsections. The locations of each sample are indicated in Figure 5.10 attached. Individual rock type samples are identified as R, natural gravels as G, and natural sands as S.

The detailed aggregate petrographic results discussed in Sections 5.2 and 5.3 were utilized in the aggregate and rock type selection process.

5.4.1 Rock Samples

5.4.1.1 Sampling

Twenty-five bedrock sources were identified for sampling, from which sufficient rock was to be recovered to permit prism and mortar bar testing. The sample locations, shown in Figure 5.10, were selected so as to be representative of those major rock units in the Province which have contributed useful material for concrete aggregate. Efforts were made: (a) to obtain samples from diverse regions of the Province; and (b) to ensure that the number of samples recovered from each of the five potentially reactive groups was broadly in proportion to the prevalence of that group. A lesser number of samples were recovered from the "innocuous" groups 8, 9 and 10. A minimum of 2 samples were taken from each group. The soft Pennsylvanian sediments which occur over more than one-third of the Province yield pebbles which are often unsound. This rock unit was therefore not included in the sampling effort. Each sample location was visited by a geologist and petrographer prior to sampling. Recovered samples were visually inspected by the petrographer to ensure uniformity prior to use in the test programme. A detailed location plan and photographs of each site are included in Appendix F.

Table 5.4 is a list of the 25 selected sites, together with a brief petrographic description of the resulting samples. Existing quarries and rock cuts were sampled by dislodging fresh blocks of rock from a single area on the working face, the objective being to minimize petrographic and textural variation. Where only limited rock exposure occurred, chunks or chips of rock were pried out or dislodged by bar or jackhammer.

5.4.1.2 Petrography

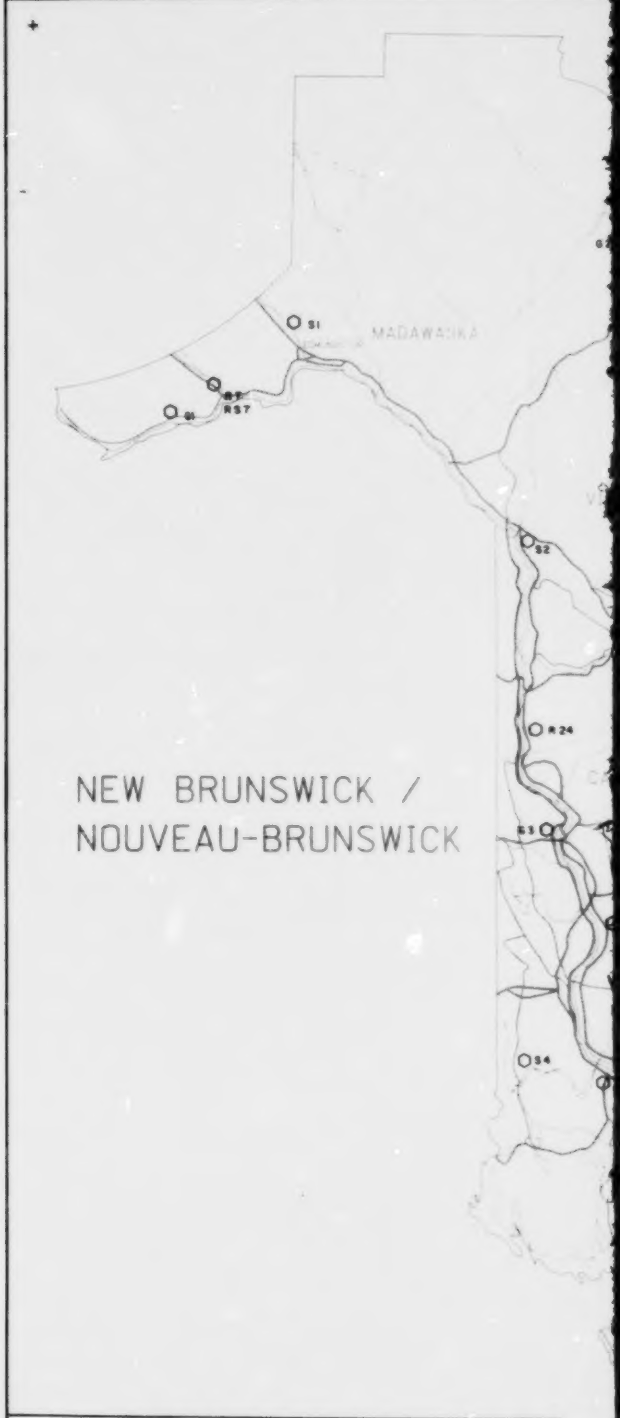
Table 5.5 shows the mineralogy of each of the 25 recovered bedrock samples, broken down by mineral assemblage. Detailed petrographic data are presented in Appendix F.

5.4.1.3 Selection

Selection of rock samples for the testing programme had been made prior to sampling. All recovered samples were tested.

5.4.2 Gravels

The eight pits from which coarse aggregates for prisms were recovered were selected so as to be petrographically representative of coarse aggregates from the 26 originally evaluated pits. The approach can be seen from inspection of Figures 5.6, 5.7 and 5.8. The Gagnon Pit (Pit 4), for example, was omitted from further testing in concrete prisms because of the petrographic similarity of its coarse fraction to the (tested) McCain Pit material. Similarly, coarse material from Blagdon was considered to be quite similar petrographically to the Porter's Cove Pit material, and the latter was chosen to represent this type. The samples selected are identified as to pit number and location in Table 6.1 included in Section 6.


S1
MADAWASKA
RS7
S2
R24
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK
R3
S4

STUDY OF THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

FIGURE 5.10 LOCATION PLAN AND IDENTIFICATION OF SAMPLES FOR TEST PROGRAM

LEGEND

○	LOCATIONS OF TEST SAMPLES
R	BEDROCK SAMPLE (+ 5mm)
RS	BEDROCK SAMPLE (– 5mm)
G	NATURAL GRAVEL (+ 5mm)
S	NATURAL SAND (– 5mm)

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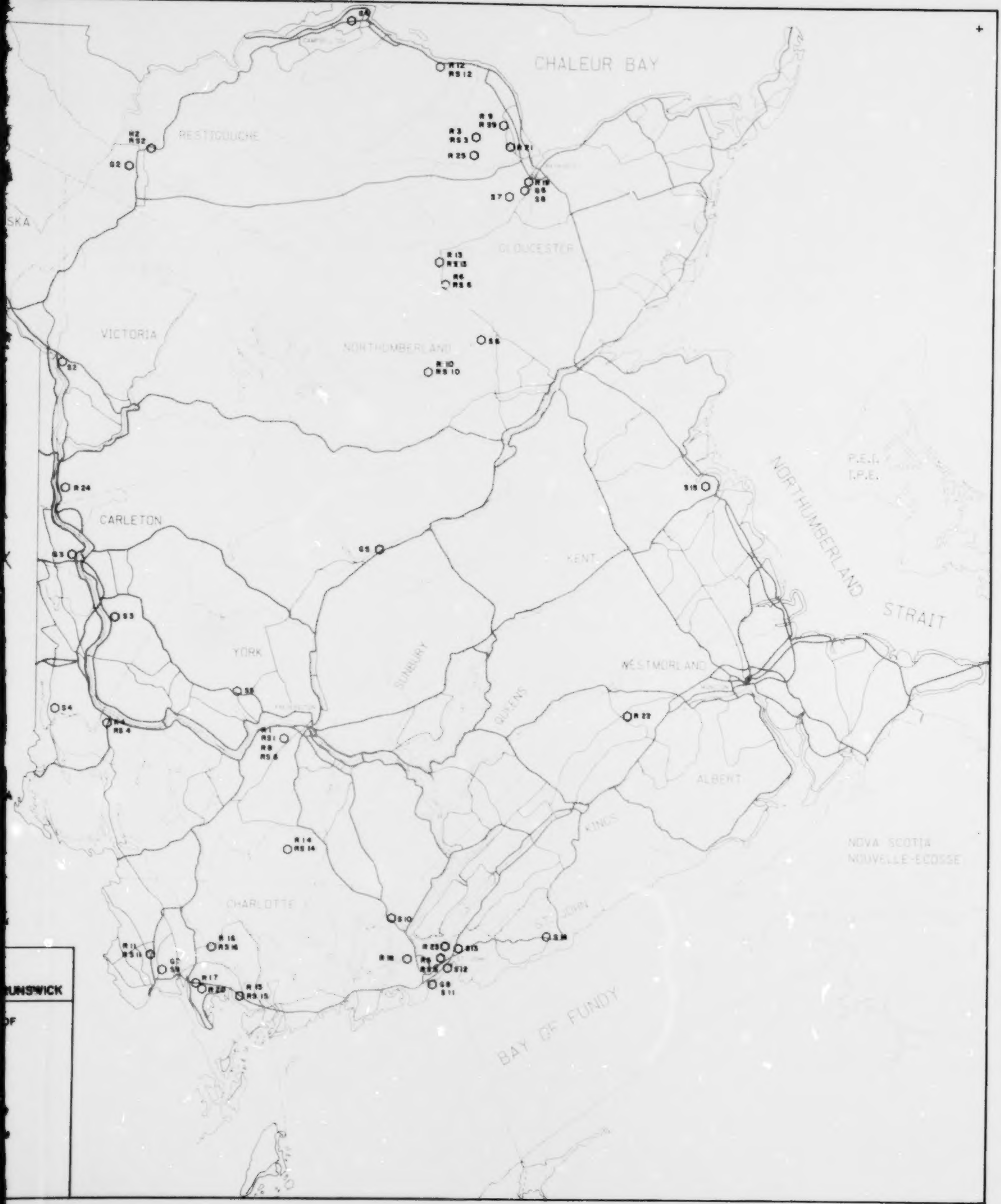

CHALEUR BAY
G4
R 12
RS 12
R 9
R 39
R 3
RS 3
R 25
R 21
R 2
RS 2
RESTIGOUCHE
G 2
R 19
G 6
S 8
S 7
SKA
R 13
RS 13
GLOUCESTER
R 6
RS 6
VICTORIA
S 6
NORTHUMBERLAND
S 2
R 10
RS 10
P.E.I.
I.P.E.
NORTHUMBERLAND STRAIT
R 24
S 15
CARLETON
G 3
G 5
KENT
S 3
YORK
SUNBURY
WESTMORLAND
QUEENS
S 5
S 4
R 4
RS 4
R 22
R 1
RS 1
R 8
RS 8
ALBERT
KINGS
NOVA SCOTIA
NOUVELLE-ECOSSE
R 14
RS 14
CHARLOTTE
S 10
ST. JOHN
S 14
R 16
RS 16
R 23
S 13
R 11
RS 11
R 18
R 5
RS 5
S 12
G 7
S 9
R 17
R 20
R 15
RS 15
G 8
S 11
UNSWICK
OF
BAY OF FUNDY

TABLE 5.4

SAMPLED ROCK TYPES BY GROUP, AGE AND LOCALITY

Group Number	Group Name	Rock Type	Age	Approx. Locality	Prism	Mortar
1	SLATE	SLATE, meta-argillite (siltstone)	Silurian	1 Springhill Quarry	R1	RS1
		Grey SLATE, meta-argillite (mudstone)	Ordovician/ Silurian	2 Kedgwick	R2	RS2
		SLATE, meta-argillite (siltstone)	(Mid/Up)Silurian	3 Nicholas Denys	R3	RS3
		Blue grey SLATE, meta-argillite (siltstone)	Ordovician	4 Meductic	R4	RS4
2	SCHIST	SCHIST	—	5 Saint John	R5	RS5
		SCHIST	Ordovician	6 Hwy 430, Heath-Steele	R6	RS6
3	GREYWACKE	META GREYWEACKE (quartz wacke)	Devonian	7 Portage-du-Lac	R7	RS7
		GREYWACKE	Silurian	8 Springhill Quarry	R8	RS8
		Blue grey GREYWACKE	(Mid/Up)Silurian	9 Nigadoo River	R9	RS9
4	QUARTZITE	QUARTZITE	Ordovician	10 Mullin Lake Road	R10	RS10
		Pale Grey QUARTZITE	Silurian	11 Moores Mills	R11	RS11
5	LAVA, TUFF	SILICIFIED VOLCANIC (Rhyolite)	Silurian	12 Jacquet River	R12	RS12
		MICROPHYRIC RHYOLITE	Ordovician	13 Hwy 430/Tomogonops L	R13	RS13
		SILICIFIED, PHYRIC, RHYOLITIC TUFF	Mississippian	14 Mt Pleasant	R14	RS14
		SILICIC (Rhyolitic) LAVA	Silurian/Devonian	15 Bethel	R15	RS15
		SILICIC FELDSPAR LAVA	Silurian	16 Rollingdam	R16	RS16
8	GRANITE	Pink GRANITE	Devonian	17 Bartlett's Mills	R17	
		GRANITE	Pre-Cambrian	18 Grand Bay	R18	
		QUARTZ MONZONITE	(Middle)Devonian	19 Connolly Quarry	R19	
9	GABBRO, BASALT	QUARTZ GABBRO	Devonian	20 Bartlett's Mills	R20	
		PHYRIC, CHLORITIZED BASALT	(Middle)Ordovician	21 Beresford	R21	
10	LIMESTONE, DOLOMITE	LIMESTONE	Mississippian	22 Havelock Quarry	R22	
		DOLOMITE	Pre-Cambrian	23 Brookville Quarry	R23	
		Mid grey LIMESTONE	Ordovician/ Silurian	24 Muniac	R24	
		LIMESTONE	—	25 Sormany	R25	
				TOTAL NO. SAMPLES:	25	16
				TOTAL NO. TESTS:	100	32

TABLE 5.5

SUMMARY OF BEDROCK PETROGRAPHY

GROUP NO.	1				2		3			4		5					8			9		10			
GROUP NAME	SLATE				SCHIST		GREYWACKE			QUARTZITE		LAVA/TUFF					GRANITE			GABBRO BASALT		LIMESTONE, DOLOMITE			
SAMPLE NO.	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25
Mineral Assemblage																									
1 Pyroxene																				35					
2 Amphibole																		0.25		2					
3 Mica	60	75	30	55	5	55	3	3	28	4	4						4	3	8.5	8			0.25	2	4
4 Illite												9	0.25		10										
5 Chlorite	25	15	13	15	12	3	20	25	25		0.25		1	0.5	3	0.5	4	1.25	0.5	0.25	40	0.5	0.25		
6 Feldspar	0.33		4	3	30		10	10	10			40	70	35	30	90	70	80	80	52	50				
7 Micro-cryst.qtz.												50		60											
8 Micro-cryst.volc.							5	0.5																	
9 Quartz	13	8	50	25	45	40	50	60	35	95	95		28		55	8	20	15	10	2	0.5	0.25		3	0.5
10 Qtzte/micr silica							10																		
11 Rutile																0.5	0.5	0.25		0.25	0.5				0.25
12 Epidote					3																				
13 Sphene	0.33	0.33	0.5	0.5	1	0.5										0.5	0.5	0.25		0.25	5			0.25	
14 Dolomite																							99		
15 Calcite	0.33	1	1	0.5					0.5	0.25			0.25					0.25			3	99		94	95
16 Apatite					1												0.5		0.5	0.25					
17 Zircon	0.33	0.33	0.5				0.5	0.5	0.5	0.25	0.25	0.5	0.25	0.75	0.5			0.25	0.5						
18 Iron	0.66	0.33	1	1	1	1.5	1.5	1	1	0.5	0.5	0.5	0.25	3.75	1.5	0.5	0.5	0.25		0.25	1	0.25	0.5	0.5	0.5
TOTAL	100	100	100	100	98	100	100	100	100	100	100	100	100	100	100	100	100	101	100	100	100	100	100	100	100

5.4.3 Sands

Fifteen of the 26 recovered sand samples were selected for testing in the mortar bar programme. Selection was based on obtaining representative samples from the various geographic regions, although those sands containing high proportions of silic material, thought to be potentially deleterious, were favoured. The samples selected are identified as to location and pit number in Table 6.1 included in Section 6.

6.0 AGGREGATE TESTING PROGRAM

6.1 General

As noted in Section 5.4, twenty-five basic rock types, eight natural gravels and fifteen natural sands were selected for testing.

Three basic types of test were undertaken on these materials. These were standard and accelerated concrete prism tests CSA A23.2-14A, standard mortar bar tests ASTM C227 and accelerated mortar bar tests on a selected number of aggregates, principally greywackes and argillites, schist, and selected natural gravels. In addition, detailed petrographic studies were carried out on a number of the prism specimens after the two year measurements. Again, these specimens were those having coarse aggregate composed of argillites, greywackes, schists and selected natural gravels.

Full details on test procedures and mix designs are given in Appendix G.

6.2 Materials

The materials used in the testing program consisted of aggregate, cement, water and sodium hydroxide. Each is discussed in the following subsections.

6.2.1 Aggregate

Aggregate for the testing program was obtained from natural sand and gravel sources and from bedrock sources.

Twenty natural aggregates were tested, either as sand or coarse aggregate or both. These sources are shown in Table 6.1. Petrographic data are summarized in Section 5.0. Twenty-five bedrock samples of coarse aggregate were tested and sixteen of sand manufactured from the bedrock samples. The sources are shown in Table 6.2. Petrographic data are summarized in Section 5.0 and detailed analyses are presented in Appendix F.

Five control aggregates were obtained from MTC Ontario, for use in the test programmes. These were an alkali-silica reactive material; an alkali-silicate reactive material; a known non-reactive coarse aggregate and sand; and an alkali-carbonate reactive rock. Details of these aggregates are given in Table 6.3.

6.2.1.1 Aggregate Preparation

The bedrock samples obtained were passed through a jaw type laboratory crusher until a sufficient quantity was produced of each of the three required sizes, i.e., 20-14 mm, 14-10 mm and 10-5 mm.

The material was then separated using a Gilson TS2 sieve shaker with the appropriate screen sizes, washed, dried and stored in clean, sealed plastic bags to prevent contamination.

The natural gravels were prepared in the same manner as the rock samples, except that only a minimal amount of crushing was required.

Photographs of all prepared coarse aggregate were obtained for reference purposes.

Fine aggregate for all concrete test prisms was Guelph Sand supplied by MTC Ontario.

TABLE 6.1

NATURAL GRAVEL AND SAND AGGREGATE SOURCES

	Pit	Fraction Tested	Petrography of Fraction Tested Rock Group						
			1	2	3	4	Prism	Mortar Bar	Accel. Mortar Bar
1.	Bosse	(sand)	46	-	42	12	-	S1	
2.	Viel	(stone)	88	-	12	-	G1	-	OG1
3.	Restigouche	(stone)	48	48	4		G2	-	
4.	Gagnon	(sand)	42	18	32	8	-	S2	
5.	McCain	(stone)	45	48	7		G3	-	OG3
7.	Audet	(stone)	34	62	4		G4	-	
9.	Boone	(sand)	36	18	36	10	-	S3	
10.	Kirkland	(sand)	39	29	22	10	-	S4	
11.	Zealand	(sand)	12		88		-	S5	
12.	Porters Cove	(stone)	77		23		G5		
13.	Shaddick Lake	(sand)	6		71	23	-	S6	
14.	Blue Mountain	(sand)	22	-	54	24	-	S7	
15.	Gloucester	(stone)	62	-	38		G6		
		(sand)	12	-	55	33		S8	
16.	Valley Road	(stone)	80	-	20		G7		OG7
		(sand)	40	-	51	9		S9	
18.	Blagdon	(sand)	19	-	68	13		S10	
19.	Chitticks	(stone)	80	1	19		G8		OG8
	(McNulty)	(sand)	8	-	76	16		S11	
20.	Likeleys	(sand)	20	3	61	16		S12	
21.	Debley	(sand)	8	-	70	22		S13	
23.	Seeley	(sand)	17	-	72	11		S14	
26.	Mill Creek	(sand)	14	-	70	14		S15	

Key:

STONE (5 mm + sizes):

Group

1. Sedimentary rocks, their metamorphic equivalents, volcanogenic rocks containing microcrystalline quartz or cryptocrystalline silica.
2. Carbonaceous rocks.
3. Igneous rocks, volcanogenic rocks and their metamorphic equivalents free of cryptocrystalline silica.

SAND (5 mm - sizes):

Group

1. Sedimentary rocks, their metamorphic equivalents, volcanogenic rocks containing microcrystalline quartz or cryptocrystalline silica.
2. Carbonaceous rocks.
3. Quartz, feldspar, other minerals, igneous rocks, basic volcanogenic rocks and their metamorphic equivalents.
4. Cryptocrystalline silica, strained quartz.

TABLE 6.2

BEDROCK AGGREGATE SAMPLES

Group Number	Rock Types	Prevalence		No. of Samples	Approximate Locality	Prism	Std. Mortar	Accel. Mortar
		[a]	[b]					
1	SLATE, Meta-argillite	21	85	4	1 Springhill Quarry	R1	RS1	OR1
					2 Kedgwick	R2	RS2	OR2
					3 Nicholas Denys	R3	RS3	OR3
					4 Meductic	R4	RS4	OR4
2	SCHIST	6	60	2	5 Saint John	R5	RS5	OR5
					6 Hwy 430, Heath-Steele	R6	RS6	-
3	GREYWACKE	13	81	3	7 Portage-du-Lac	R7	RS7	OR7
					8 Springhill Quarry	R8	RS8	OR8
					9 Nigadoo River	R9	RS9	OR9
4	QUARTZITE	5	65	2	10 Mullin Lake Road	R10	RS10	-
					11 Moores Mills	R11	RS11	-
5	SILICIFIED VOLCANICS, SILICIC LAVAS, RHYOLITE	6	79	5	12 Jacquet R.	R12	RS12	-
					13 Hwy 430/ Tomogonops L.	R13	RS13	-
					14 Mt Pleasant	R14	RS14	-
					15 Bethel	R15	RS15	-
					16 Rollingdam	R16	RS16	
8	GRANITE	29	90	3	17 Bartlett's Mills	R17	-	-
					18 Grand Bay	R18	-	-
					19 Connolly Quarry	R19	-	-
9	GABBRO, BASALT	3	56	2	20 Bartlett's Mills	R20	-	-
					21 Beresford	R21	-	-
10	LIMESTONE, DOLOMITE	16	48	4	22 Havelock Quarry	R22	-	-
					23 Brookville Quarry	R23	-	-
					24 Muniac	R24	-	OR24
					25 Sormany	R25	-	-
	Total No. Samples:		25		Total No. Samples:	25	16	9
					Total No. Tests:	100	32	9

Notes:

Fraction tested 5 mm + size.

[a] Overall abundance at 32 localities (26 pits and 6 quarries)
[b] Percentage of the 154 site fractions analyzed (from 32 localities) where this group occurred

TABLE 6.3

CONTROL SPECIMENS - AGGREGATE SOURCES

Reaction	Rock Type	Location	Prism	Std. Mortar Bar
Alkali-Silica	Limestone 96.3% Slightly shaly limestone 2.3% Cherty limestone 0.5% Shaley limestone 0.8% Shale 0.1%	SPRATT Quarry (MTC Ontario)	CR1	CRS1
Alkali-Silicate	Sandstone & arkosic sst 31.5% Argillite & greywacke 32.5% Quartzite & qtz. 11.1% Granite, diabase, gneiss 25.1%	Sudbury Gravel (MTC Ontario)	CG2	CS2
Nonreactive	Medium-coarse grained Dolomite	Nelson (MTC Ontario)	CR3	CRS3
Alkali-Carbonate Reactive	Dolomitic limestone	Pittsburgh (MTC Ontario)	CR4	CRS4
Nonreactive Sand	Natural limestone quartz sand, small amount of chert	Guelph (MTC Ontario)		CS5
TOTAL SAMPLES			4	5
TOTAL NO. TESTS			16	10

Several grain size analyses were performed on the Guelph sand; its fineness modulus was found to vary from 2.300 to 2.668. Therefore, the sand for the prism concrete mixes was prepared in five portions in order to attain a more consistent fineness modulus between batches, i.e., enough sand for approximately 15 concrete batches was produced at once.

Since the sand was received in bags of approximately of the same weight, an equal portion from each bag, based on the desired number of concrete mixes, was placed in several containers. Each container then held a representative sample of sand with only two required for each concrete mix. Sieve analyses were then performed on representative samples of the produced sand to determine the fineness modulus for mix design purposes. The weight of sand in each container was then adjusted as necessary to meet the batch weight required for each mix.

Fine aggregate for the mortar bar test was obtained from three types of sources: natural sands; sand produced from bedrock, and sand produced by crushing natural gravels. The bedrock and gravel samples were crushed to sand sizes and then separated on the appropriate sieve sizes for the test. Natural sands were separated in the same manner. The individual sizes were then washed, dried and stored in sealed plastic bags to prevent contamination.

6.2.2 Cement

Cement used in the prism and standard mortar bar test program was Type 10 Normal Portland, supplied in bag form. All bags were obtained from the same batch. Cement was supplied by Maritime Cement from their Brookfield, N. S. plant. Typical chemical and physical analysis data are shown in Table 6.4.

TABLE 6.4 - CHEMICAL AND PHYSICAL CHARACTERISTICS OF CEMENT

CANADA CEMENT LAFARGE LTD.
45 ALDERNEY DRIVE, SUITE 310, QUEEN SQUARE, DARTMOUTH, N.S. B2Y 2N6

March 6, 1987

Mr. Daryl DeMerchant, M.Sc., P.Eng.
A.D.I. Limited
Suite 407, 1133 Regent Street
FREDERICTON, N.B.
E3B 3Z2

Dear Mr. DeMerchant;

Enclosed please find a copy of the Physical and Chemical Analysis of the cement which was shipped on January 30, 1987.

The alkalies were determined by two different methods; (1) X-Ray Fluorescence Spectrometry, and (2) Flame Photometry. The alkalies, as determined by Method One were:

Na2O = 0.07 and K2O = 1.33 thus the Na2O
Equil = 0.94.

The alkalies, as determined by Method Two were:

Na2O = 0.09 and K2O = 1.33 thus the Na2O
Equil = 0.94.

Should you have any questions regarding the results, or require any additional information please do not hesitate to contact me.

Yours truly,

J. Bruce Blair

J. Bruce Blair, P.Eng.
Manager of Technical Sales
ATLANTIC REGION

JBB/ymb
Enclosure

MARITIME CEMENT•

CEMENT TEST REPORT

Analysis for Laboratory: Brookfield

Samples from: Brookfield

Bulk Shipping Type I Normal Portland

Shipped January 30, 1987

NAME: Mr. Daryl DeMerchant, M.Sc., P. Eng.

ADDRESS: A.D.I. Limited, Suite 407, 1133 Regent Street
FREDERICTON, N.S. E3B 3Z2

Chemical Analysis

Silica (SiO2)	20.22 %
Alumina (Al2O3)	5.70 %
Iron Oxide (Fe2O3)	2.19 %
Calcium Oxide, Total (TCaO)	63.33 %
Magnesium Oxide (MgO)	1.32 %
Sulphur Trioxide	3.89 %
Loss on Ignition	2.67 %
Insoluble Residue	1.00 %
Calcium Oxide, Free (FCaO)	0.84 %
Equivalent Alkali (Na2O)	0.94 %
C3A	11.4 %

6.7

Physical Analysis

Fineness 45um seive	82.6 % pass:
Blaine	403 m2/kg
Setting Time - Initial	100 minute:
Autoclave Expansion	0.05 %
Compressive strength at 3 days	29.0 MPa
Compressive strength at 7 days	32.8 MPa
Compressive strength at 28 days	37.6 MPa

Specifications:

Comments:

Certified: J. Bruce Blair

The alkali content of the cement expressed as Na_2O was 0.94 percent, based on X-ray Fluorescence Spectrometry and Flame Photometry. An independent check on three samples from the batch indicated alkali contents of 0.99 percent, 1.01 percent, 1.03 percent by Atomic Absorption. For purposes of calculating the amount of NaOH required to raise the alkali content to 1.25 percent, an initial value of 0.94 percent, as indicated by the supplier was used.

A similar cement from the same supplier was used for the accelerated mortar bar tests. The alkali content was 0.92 percent Na_2O.

6.2.3 Water

Water for mixing was tap water from the City of Fredericton drinking water supply.

6.2.4 Sodium Hydroxide

Reagent grade sodium hydroxide in pellet form was as supplied by Anachemia, Reagent grade AC-8370.

6.3 Specimen Identification

The identification and reference system shown below was developed to identify and reference all specimens. The reference numbers identify the source type, i.e., natural gravel, sand or bedrock; the source aggregate location by reference to Tables 6.1, 6.2 and 6.3; the storage condition; the alkali content of the cement; and the casting sequence.

Key:

Aggregates Tested in Concrete Prism Tests

Typical Prism ID No. G8-1A,B,C

Prefix		Description of Test Material
R	-	coarse aggregate (+5 mm) from bedrock sources
G	-	coarse aggregate (+5 mm) from natural gravel sources
C	-	control specimen
8	-	coded source of aggregate referenced to locations in Tables 6.1, 6.2, 6.3
1	-	coded storage condition and cement alkali content

1 = 0.94% Na_2O storage at 23°C in 100% RH room

2 = 0.94% Na_2O storage over water at 38°C

3 = 1.25% Na_2O storage at 23°C in 100% RH room

4 = 1.25% Na_2O storage over water at 38°C

A,B,C refers to individual prisms in a series of three. Prism specimens 1A,B,C and 2A,B,C were cast from the same batch of concrete. Prisms 3A,B,C and 4A,B,C were cast from the same batch of concrete.

Aggregates Tested in Standard Mortar Bar Tests

Typical ID No. RS8 - 2A,B,C,D

Prefix

RS - aggregate manufactured from bedrock source

S - aggregate from natural sand source

C - control specimen

8 - coded source of aggregate as before

2 - coded storage condition and cement alkali content

2 = 0.94% Na_2O storage at 38°C over water

4 = 1.25% Na_2O storage at 38°C over water

A,B,C,D refers to individual mortar bars in a series of four. Bars A and B were cast from one mortar batch and C and D from a separate batch.

Aggregates Tested in Accelerated Mortar Bar Tests

Typical ID No. OR8 - A,B,C,D

Prefix

O - accelerated mortar bar test storage in 1N NaOH at 80°C

R - aggregate from bedrock source

G - aggregate from natural gravel

8 - coded source of aggregate as before

A,B,C,D refers to individual mortar bars in a series of four. A and B were cast from one batch of mortar and C and D from a separate batch.

6.4 Concrete Prism Test (CSA A23.2-14A)

6.4.1 General

As noted previously, prism tests were carried out on 25 rock types, 8 natural gravels and 4 control samples. Each material was tested under four different conditions as follows:

- Alkali content of cement as purchased (0.94% Na_2O eq);
  Specimens stored at 23°C and 100% R.H.;

  Specimens stored at 38°C in sealed containers over water.

- Alkali content of cement increased to 1.25% Na_2O, with two storage conditions as above.

This programme allowed an assessment of the effects of both temperature and alkali content on the test results.

The complete test results in tabular form are presented in Appendix H, and in graphical form in attached Appendix 1.

In general, with the exception of the control specimens, one greywacke (R7) and one limestone (R24), the only test conditions which gave rise to significant expansions were the CSA accelerated test with a cement alkali content of 1.25% Na_2O stored over water at 38°C.

6.4.2 Control Specimens

Plots of expansion versus time for the four control specimens are presented in Figs. 6.1 and 6.2.

The alkali-silica reactive control rock, (Spratt limestone), shows excessive expansion in the high temperature tests and with high alkali cement in the low temperature (23°C) test, but minimal expansion at low alkali and low temperature levels.

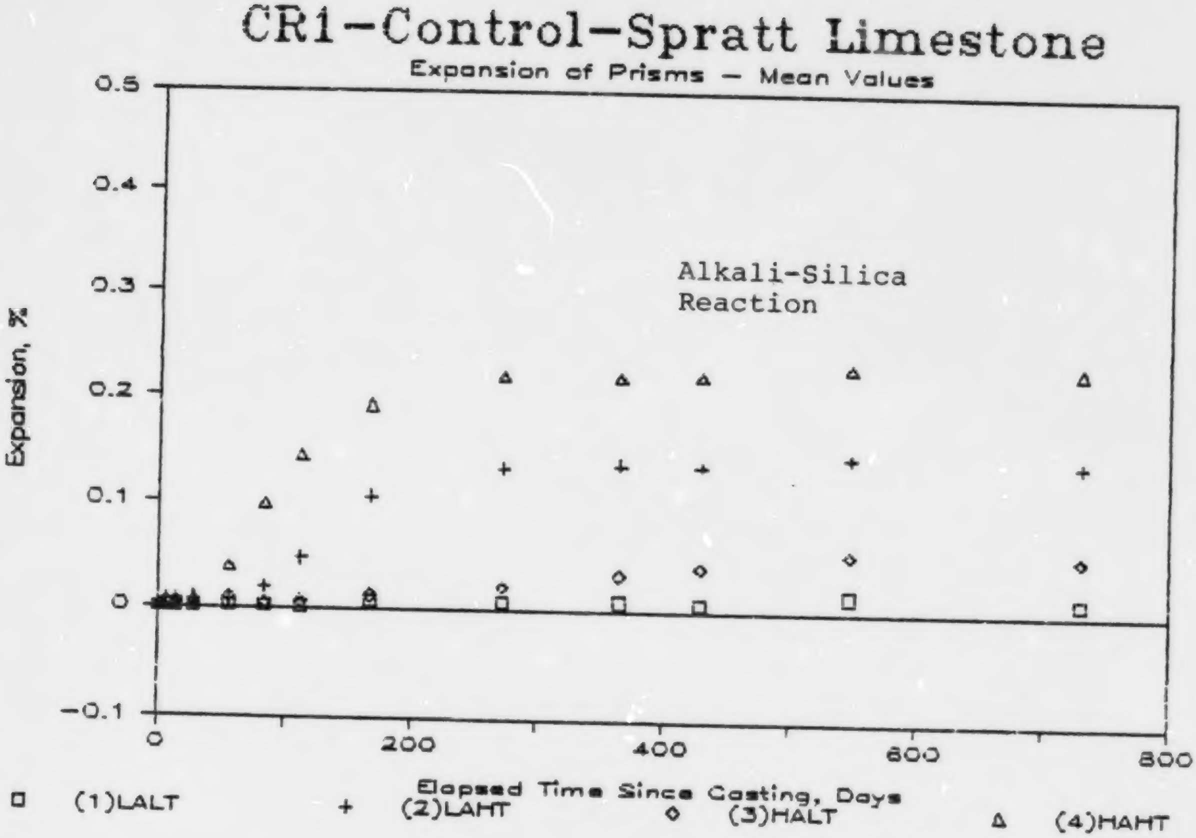
The alkali-silicate reactive control rock (Sudbury) illustrates a slow, gradual expansion, but has not exceeded recognized specification limits in the two-year test period. This material does show considerable sensitivity to alkali content at the higher (38°C) temperature.

The nonreactive control rock, (Nelson limestone) shows expansion comparable to the Sudbury material but with virtually no sensitivity to alkali content.

The carbonate reactive control rock, (Pittsburg limestone) fails all CSA prism test criteria by wide margins.

Table 6.5 illustrates typical control prism expansions compared to test results obtained on the same materials by the Ontario Ministry of Transportation and Communications.

In general, there is reasonably good agreement between the study results and MTC results, considering the variation in MTC results on the same materials. At the higher expansions with


CR1-Control-Spratt Limestone
Expansion of Prisms - Mean Values
Alkali-Silica Reaction
Expansion, %
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
200
400
600
800
Elapsed Time Since Casting, Days
(1)LALT
(2)LAHT
(3)HALT
(4)HAHT

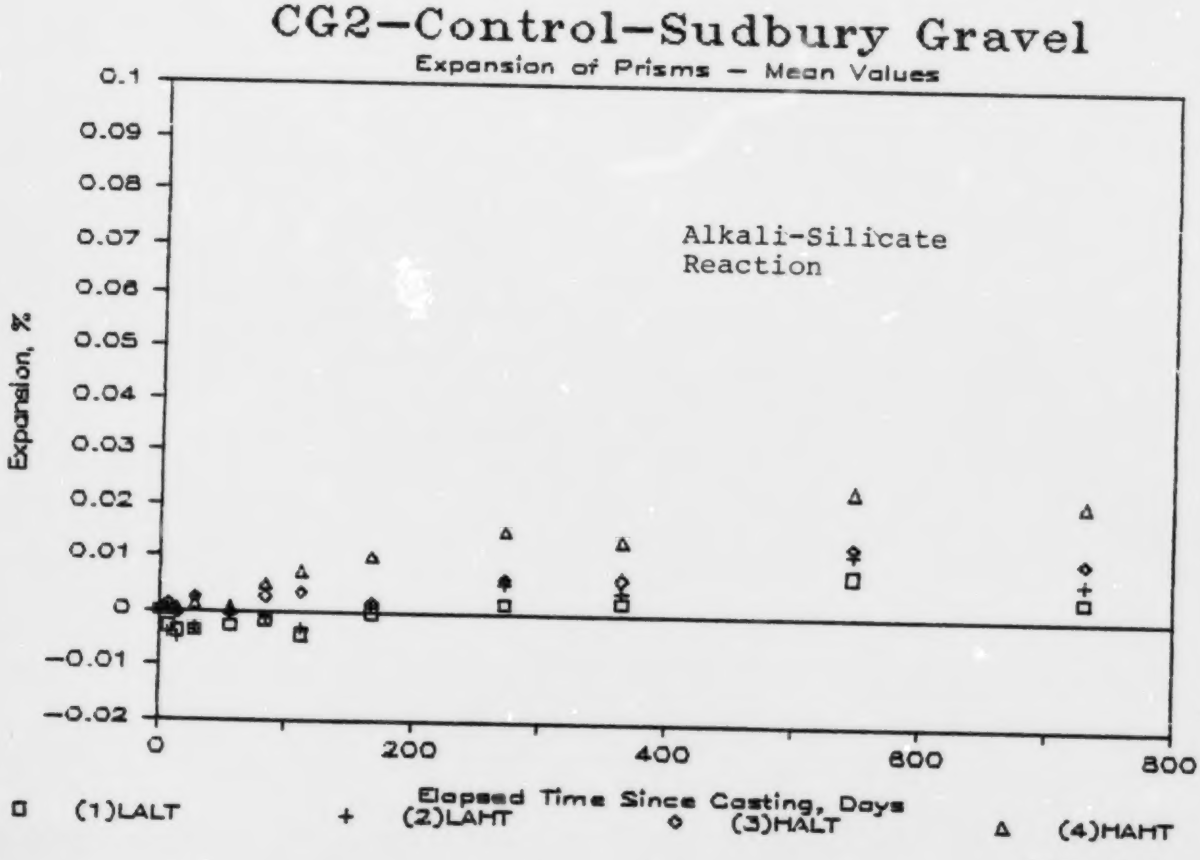
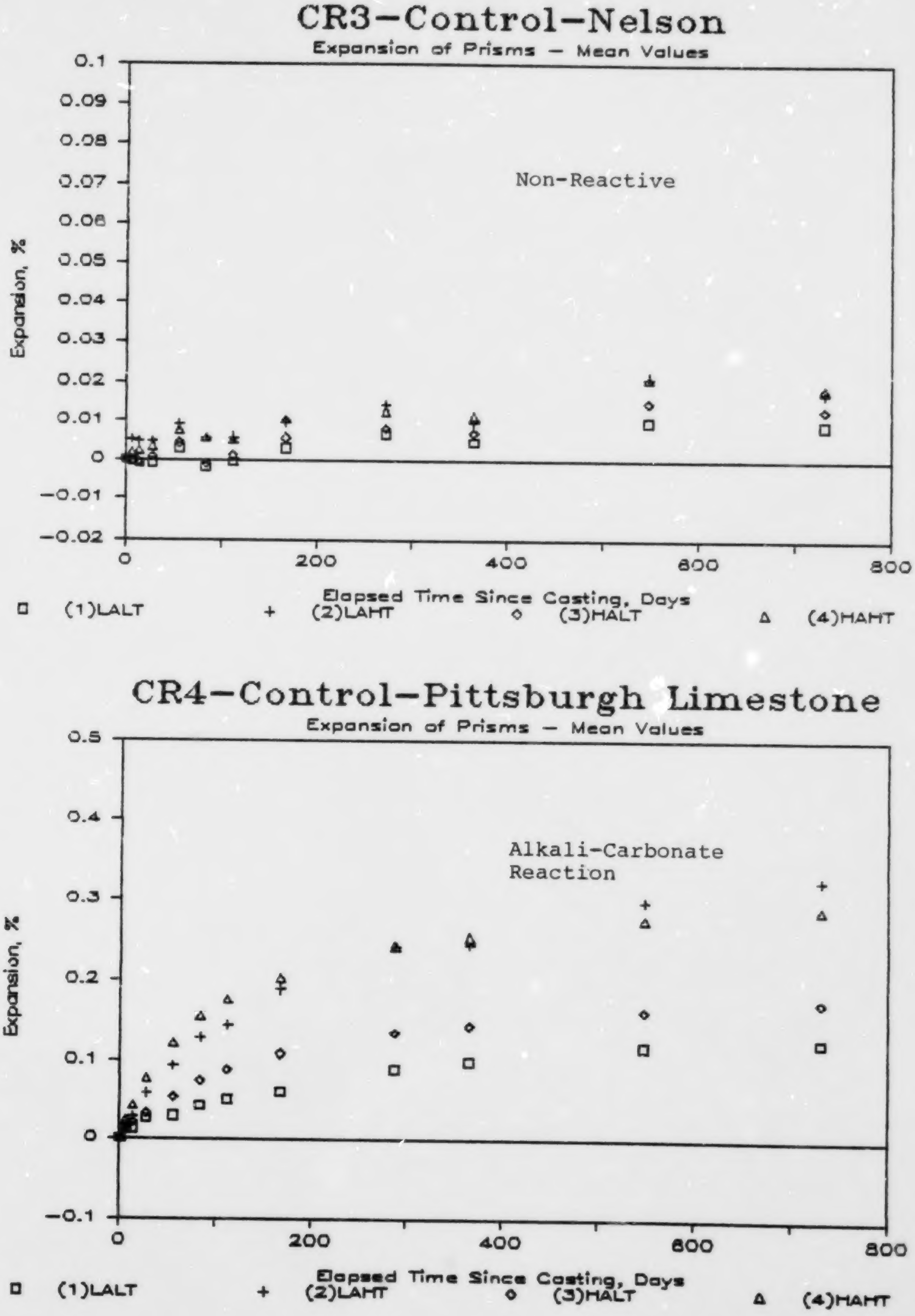

CG2-Control-Sudbury Gravel
Expansion of Prisms - Mean Values
Alkali-Silicate Reaction
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
(1)LALT
(2)LAHT
(3)HALT
(4)HAHT

Fig. 6.1


CR3–Control–Nelson
Expansion of Prisms – Mean Values
Non-Reactive
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT
CR4–Control–Pittsburgh Limestone
Expansion of Prisms – Mean Values
Alkali-Carbonate Reaction
Expansion, %
0.5
0.4
0.3
0.2
0.1
0
–0.1
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

Fig, 6,2

TABLE 6.5

COMPARATIVE EXPANSION RESULTS
PSISM CONTROL SPECIMENS

Material	Cement/Alkali Temp.	Time	MTC Results % Exp.	Study Results % Exp.
Spratt Coarse Guelph Fine CR1 (Alkali-silica)	310 kg/0.92/23°C	1 yr	0.012	0.008 (0.94% Na_2O)
	310/0.92/38°C	1 yr	0.021	0.138 (0.94% Na_2O)
	310/1.25/23°C	1 yr	0.013	0.031
	310/1.25/38°C	1 yr	0.084	0.221
	415/0.92/23°C	1 yr	0.041	-
	415/0.92/38°C	1 yr	0.101	
Sudbury Coarse Guelph Fine CG2 (Alkali-silicate)	310/0.92/23°C	1 yr	.004	.003 (0.94% Na_2O)
	310/0.92/38°C	1 yr	0.009	0.007 (0.94% Na_2O)
	310/1.25/23°C	1 yr	0.008	0.007
	310/1.25/38°C	1 yr	0.018	0.017
Nelson Coarse Guelph Fine CR3 (Non-reactive)	310/0.92/23°C	1 yr	.007	.004 (0.94% Na_2O)
	310/0.92/38°C	1 yr	0.018	0.010 (0.94% Na_2O)
	415/0.92/23°C	1 yr	0.13	0.011*
	415/0.92/38°C	1 yr	0.21	0.015*
	415/1.25/23°C	1 yr	0.006	(*study test 310 kg at 1.25% Na_2O)
	415/1.25/38°C	1 yr	0.014	
Pittsburgh Coarse Guelph Fine CR4 (Carbonate reactive)	310/0.92/38°C	56 d	.130	.120 (0.94% Na_2O)
		112 d	.217	.177
		365 d	.338	.255
	310/1.25/39°C	56 d	.088	.093
		112 d	.146	.144
		365 d	.326	.243

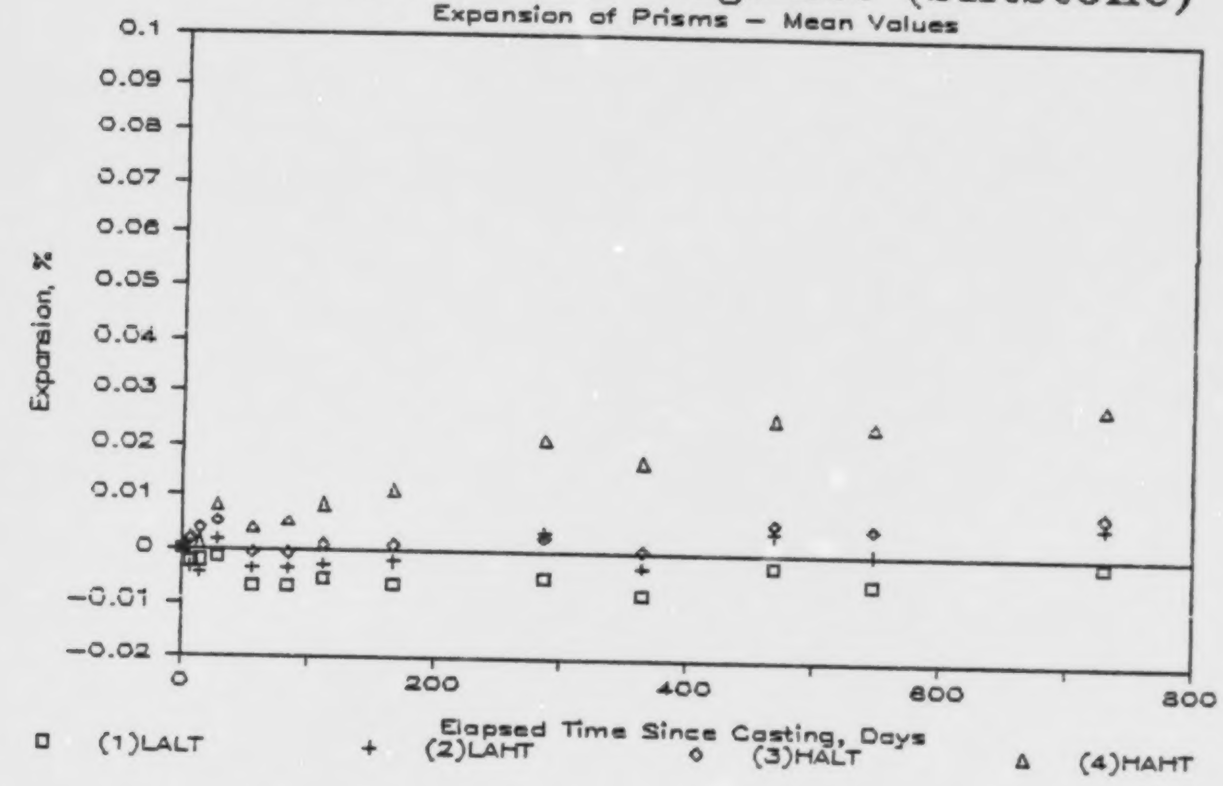
the Pittsburg material, the study results were generally less than those of MTC; however, at large expansions such as these, the degree and orientation of fracturing may have a significant influence. In general, these results on Pittsburg material approximated very closely the MTC results until the total expansion exceeded 0.15-0.2 percent.

6.4.3 Summarized Test Results

Expansion versus time graphs for several of the typical aggregate materials are presented in Figures 6.3, 6.4, 6.5, 6.6, 6.7 and 6.8. Graphs for all materials tested are appended in Appendix 1.

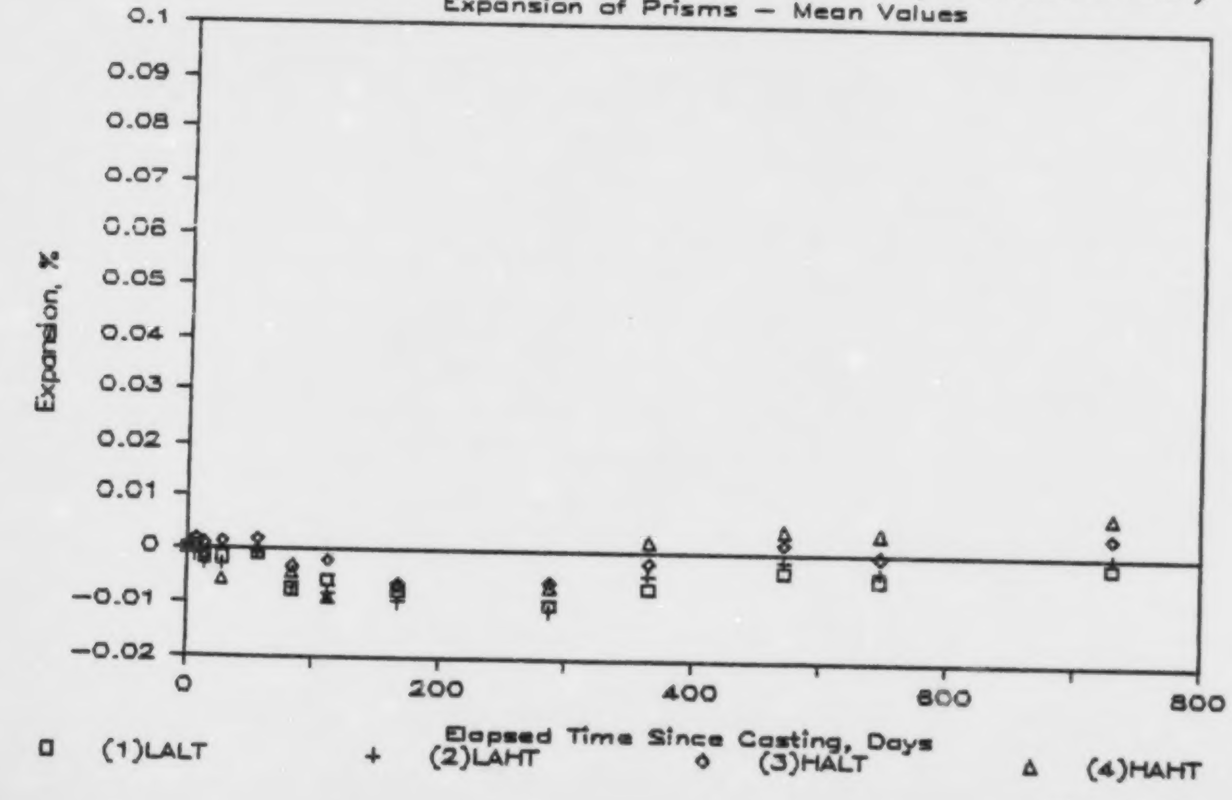
As noted previously and as can be seen from the graphical results, only the test conditions at 38°C gave significant expansions for the materials tested in this study. Accordingly, the following discussion will deal primarily with these test conditions. Only six of the 37 materials tested showed greater expansion in the 23°C test. These were specimens R22, and R23 (limestones) and gravels G3, G4, G5 and G6. Specimens G3 and G4 were limestone rich gravels. The variation in expansion between the two tests was not large, ranging from 0.001 to 0.003 percent which is probably within the range of experimental error. Nevertheless, it may be significant that this phenomena occurred mainly with limestones or limestone rich gravels.

Since the 38°C tests were carried out at two alkali contents, it is possible to relate at least approximately the response of the test aggregates to alkali levels in the concrete mixture. Test data for the 38°C conditions are summarized in Table 6.6. In addition to the test data, which show one and two year prism expansion for the two alkali levels, the sensitivity to alkali has been calculated as the difference in expansion divided by the difference in mix alkali content in kg/m^3 (0.961 kg/m^3)



R1-Slate, Meta-argillite (Siltstone)

Expansion of Prisms – Mean Values



R2-Slate, Meta-argillite (Mudstone)

Expansion of Prisms – Mean Values

Fig. 6.3

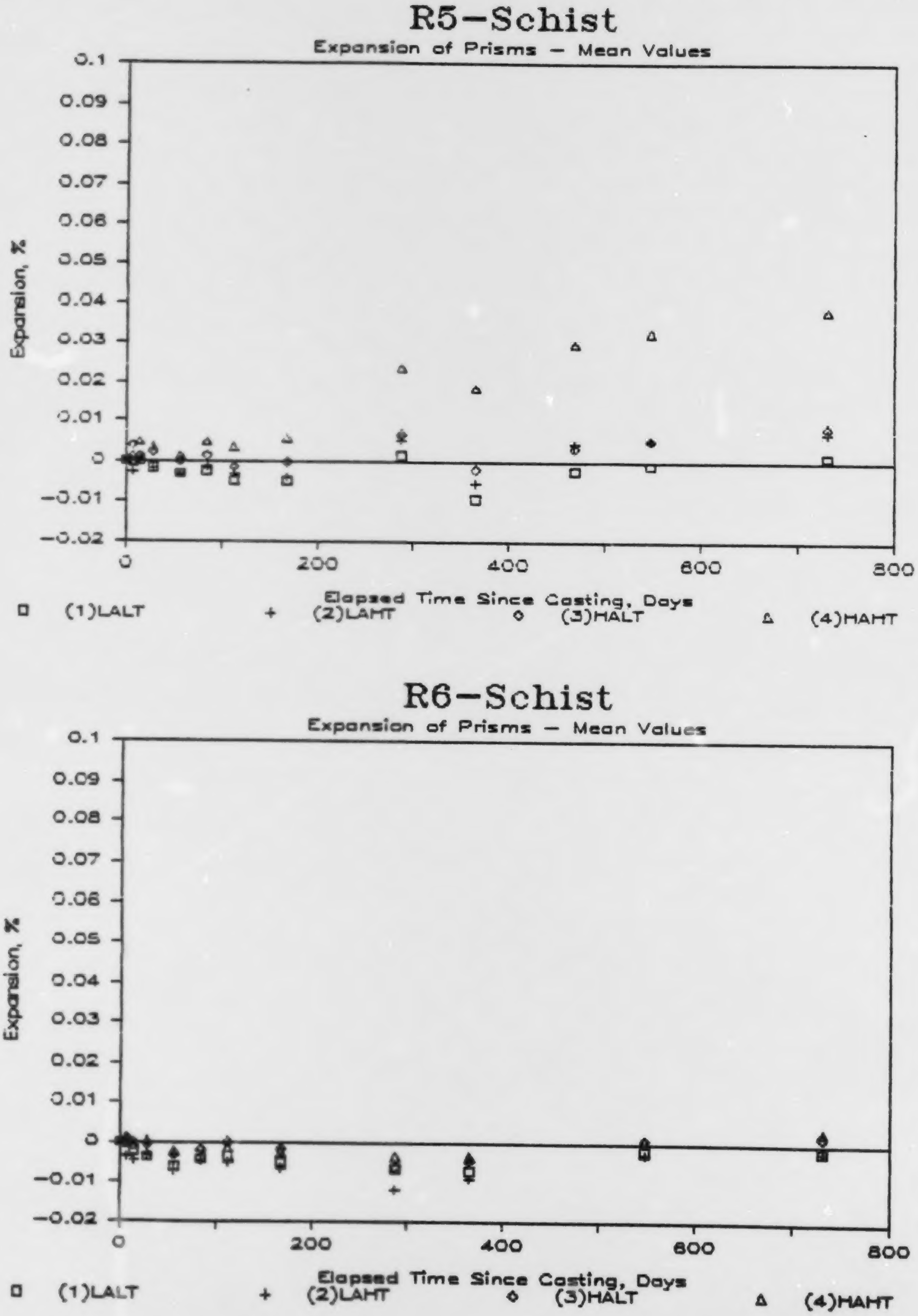
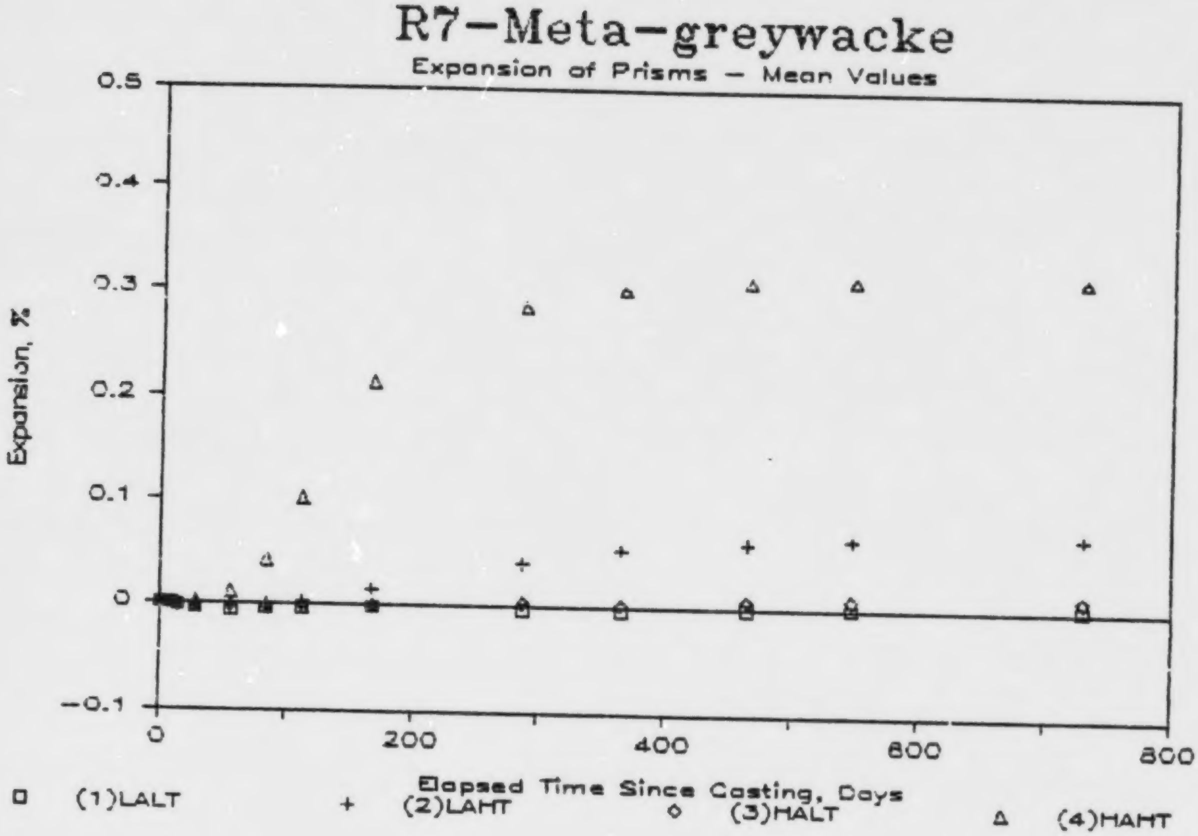
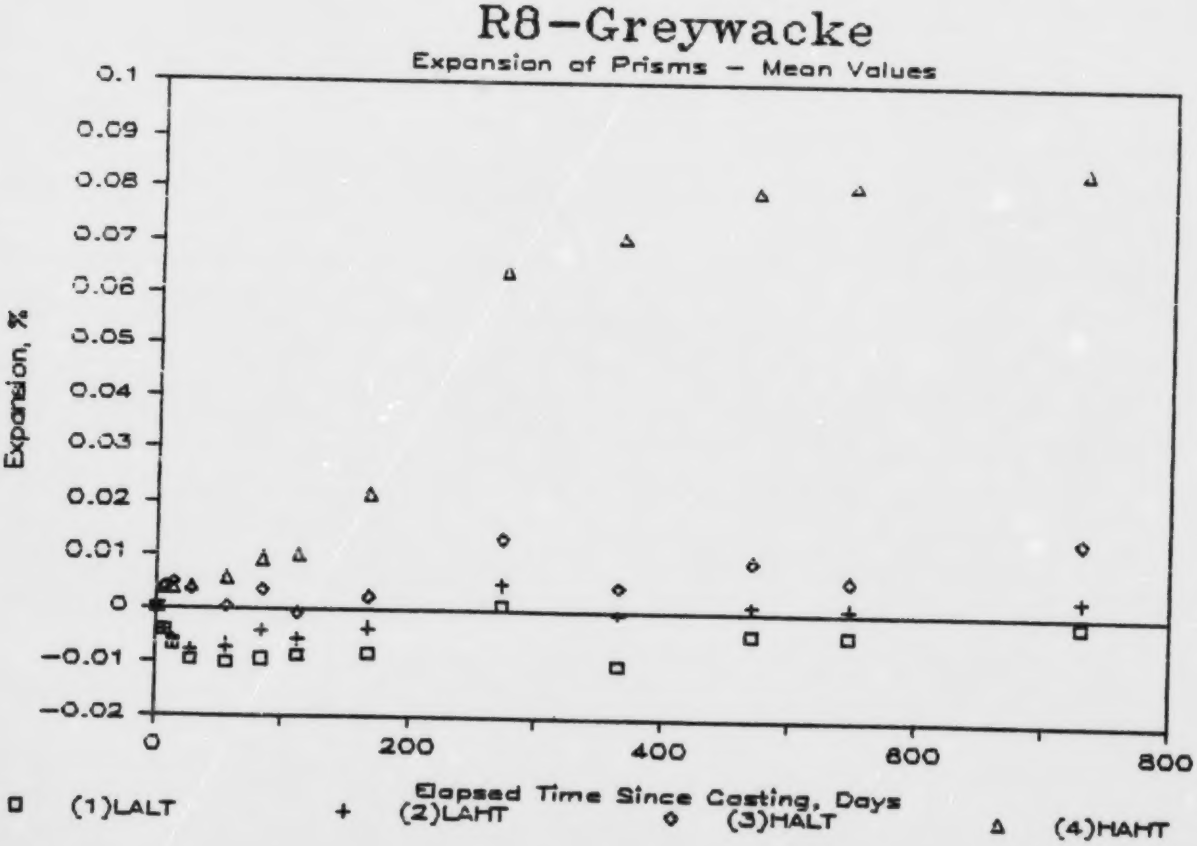

R5–Schist
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT
R6–Schist
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

Fig. 6.4

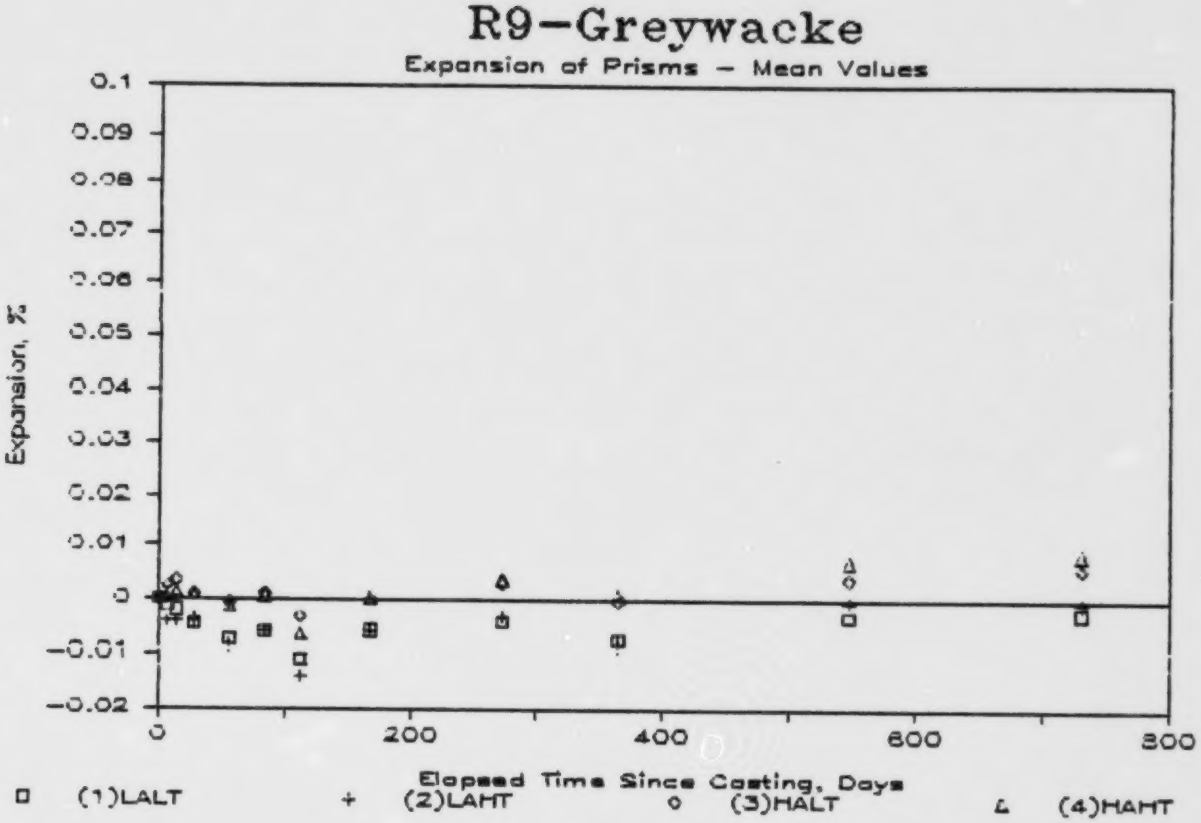

R7-Meta-greywacke

Expansion of Prisms – Mean Values


R8-Greywacke

Expansion of Prisms – Mean Values

Fig. 6.5


R9–Greywacke
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

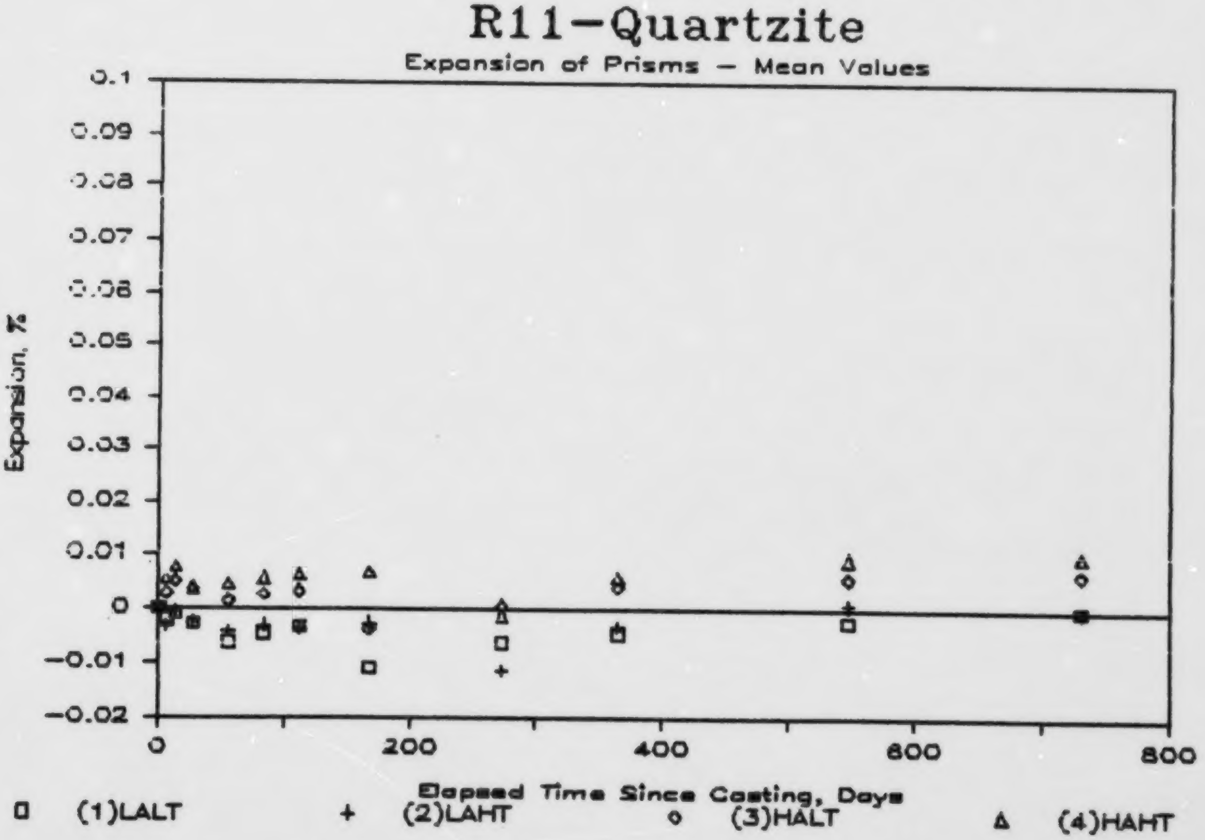

R11–Quartzite
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

Fig. 6.6

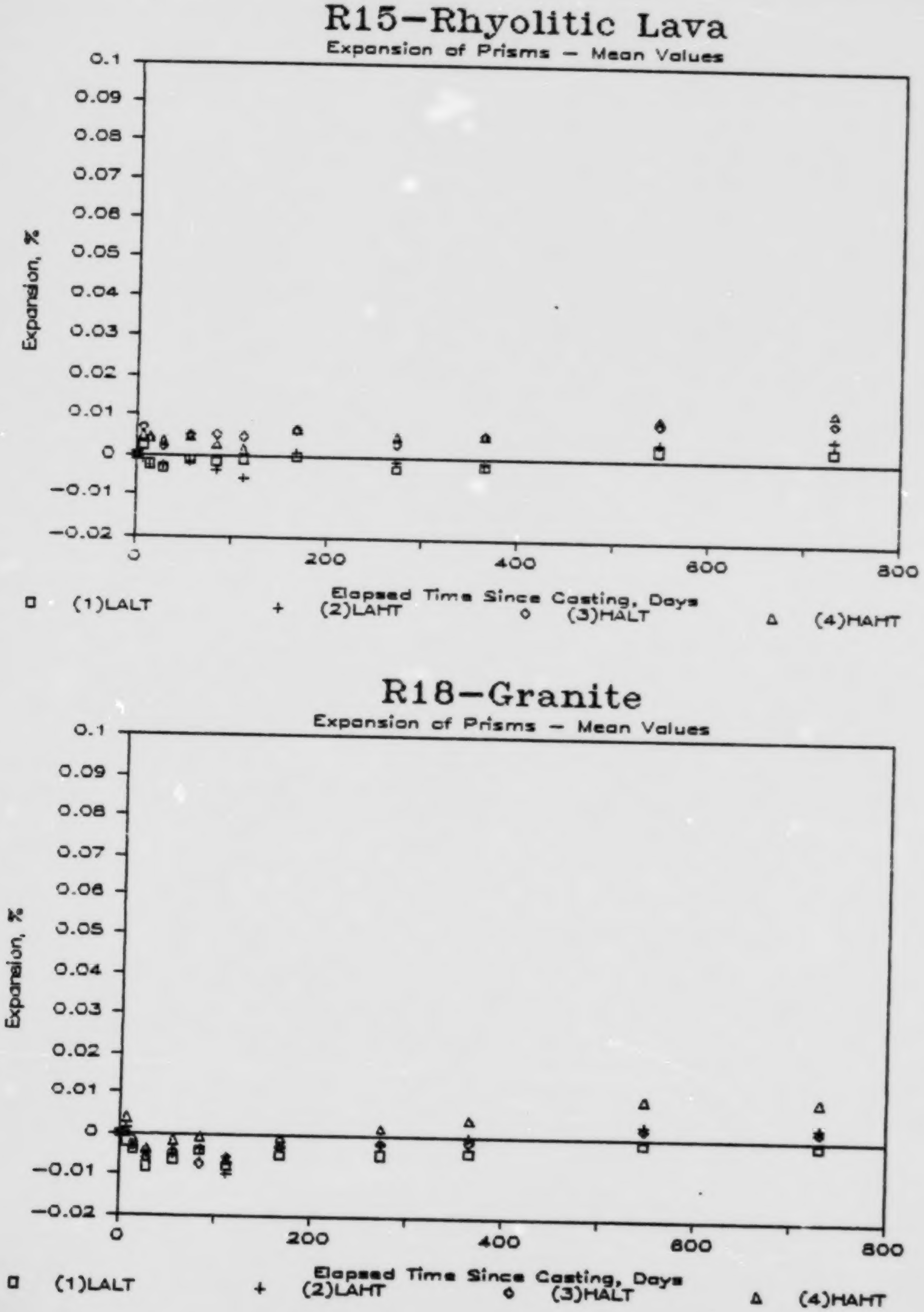
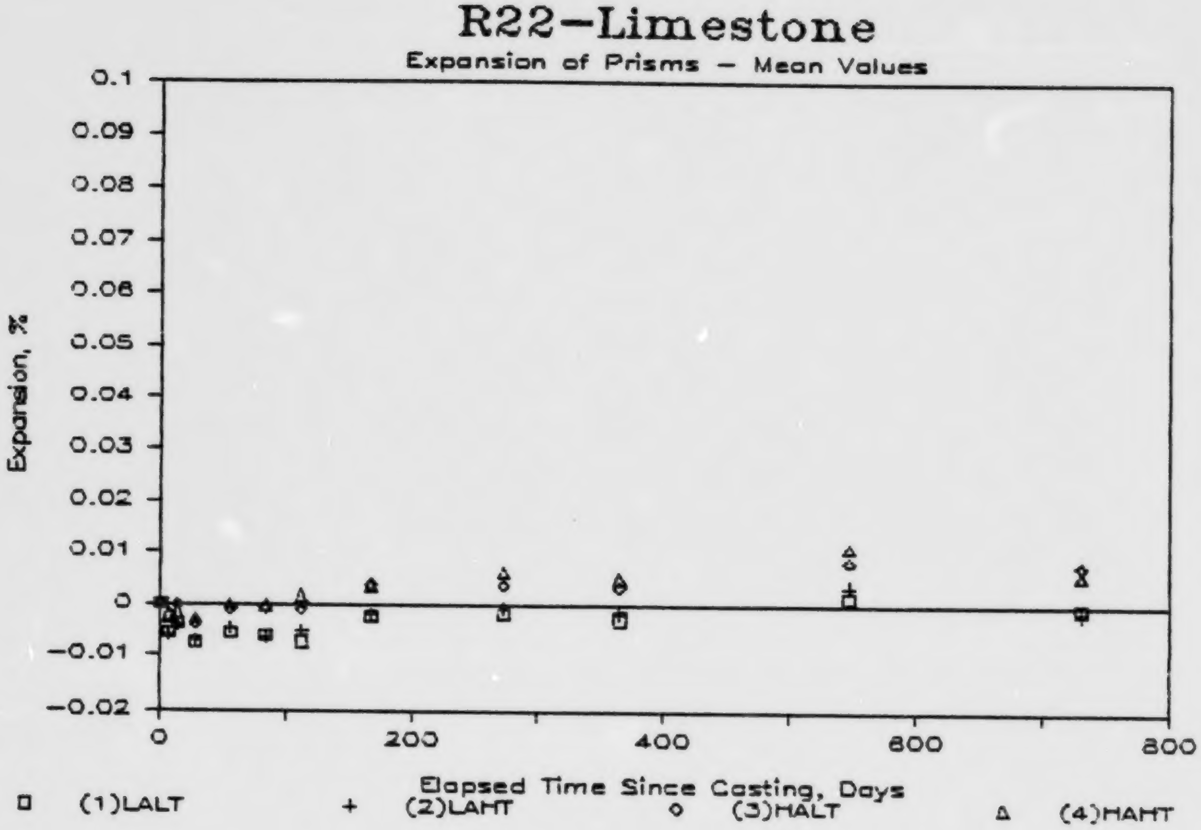

R15-Rhyolitic Lava
Expansion of Prisms - Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT
R18-Granite
Expansion of Prisms - Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

Fig. 6.7


R22−Limestone
Expansion of Prisms − Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

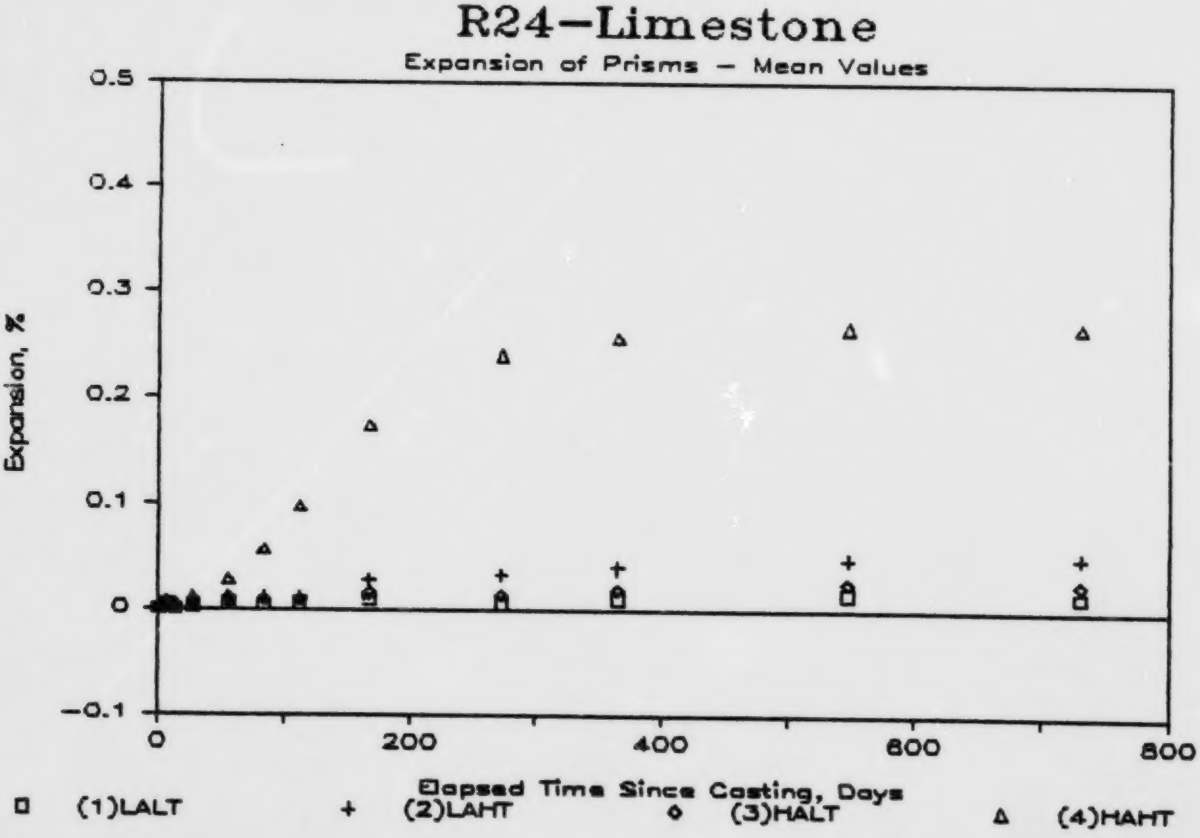

R24−Limestone
Expansion of Prisms − Mean Values
Expansion, %
0.5
0.4
0.3
0.2
0.1
0
−0.1
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

Fig. 6.8

TABLE 6.6

SUMMARY OF PRISM TEST RESULTS
38°C STORAGE CONDITIONS

Spec No.	1 yr Exp. %		2 yr Exp. %		S	Index kg/m^3	Comments on Prism Appearance
	0.94% Na_2O	1.25% Na_2O	0.94% Na_2O	1.25% Na_2O			
R1	−0.003	0.017	0.006	0.028	0.021	5	minor white deposits
R2	−0.004	0.002	0.000	0.008	0.006	10	clean
R3	−0.001	0.006	0.000	0.008	0.007	8.5	minor white deposits
R4	−0.011	0.015	−0.001	0.025	0.027	4.8	fine cracking, white deposits
R5	−0.006	0.019	0.007	0.038	0.026	4.7	minor white deposits
R6	−0.009	−0.004	−0.002	0.003	0.005	12.3	clean
R7	0.053	0.302	0.070	0.314	0.259	2.9	extensive cracking and deposits
R8	−0.001	0.071	0.003	0.081	0.075	3.5	extensive cracking, minor deposits
R9	−0.008	0.001	−0.001	0.009	0.009	8.0	clean
R10	−0.002	0.003	0.003	0.009	0.005	11.0	
R11	−0.003	0.006	0.000	0.010	0.009	7.5	
R12	−0.005	0.002	−0.003	0.002	0.007	9.1	
R13	−0.003	0.006	0.001	0.008	0.009	7.5	
R14	−0.001	0.003	0.002	0.005	0.004	12.7	
R15	−0.002	0.006	0.005	0.013	0.008	8.0	
R16	−0.002	0.007	0.005	0.014	0.009	7.4	
R17	−0.002	.004	0.006	0.013	0.006	9.7	
R18	0.000	.004	0.003	0.009	0.004	12.4	
R19	0.000	.004	0.002	0.008	0.004	12.4	
R20	−0.003	0.004	0.002	0.009	0.007	8.8	
R21	−0.000	0.004	0.002	0.009	0.004	12.4	
R22	−0.002	0.005	−0.002	0.005	0.007	8.7	
R23	0.003	0.008	0.005	0.011	0.005	10.0	
R24	0.038	0.259	0.049	0.271	0.230	2.9	extensive cracking and deposits
R25	0.006	0.013	0.013	0.023	0.007	7.6	

TABLE 6.6 (continued)

Spec No.	1 yr Exp. %		2 yr Exp. %		S	Index kg/m^3	Comments on Prism Appearance
	0.94% Na_2O	1.25% Na_2O	0.94% Na_2O	1.25% Na_2O			
G1	0.003	0.009	0.011	0.016	0.006	8.9	
G2	0.002	0.005	0.005	0.010	0.003	15.2	
G3	−0.002	0.005	0.001	0.010	0.007	8.7	
G4	−0.002	0.004	0.003	0.009	0.006	9.7	
G5	−0.001	0.002	0.006	0.007	0.003	16.1	
G6	0.002	0.006	0.006	0.008	0.004	12.0	
G7	0.003	0.014	0.007	0.016	0.011	6.2	
G8	0.006	0.015	0.012	0.020	0.009	6.5	
CR1	0.138	0.221	0.142	0.233	0.086	1.8	alkali-silica reactive control
CG2	0.004	0.014	0.007	0.022	0.010	6.4	alkali-silicate reactive control
CR3	0.010	0.011	0.017	0.019	0.001	32.9	non-reactive control
CR4	0.244	0.255	0.325	0.289	0.011	-	carbonate reactive nontrol

Note:

S = sensitivity to alkali = $\frac{\text{Exp } 1.25\% - \text{Exp } 0.94\%}{0.961}$

Index = calculated amount of alkali to give expansion of 0.04% at one year which is the difference between 0.94% of 310 kg/m^3 and 1.25% of 310 kg/m^3. Using the sensitivity from these calculations, an index number was calculated for each specimen assuming that expansion is a linear function of alkali content (see Fig. 3.2 and Ref. 28). The index number was calculated as the amount of alkali (Na_2O) in kilograms per cubic metre of concrete required to give an expansion of 0.04 percent in one year. This value was chosen because it represents the approximate expansion at which laboratory prisms crack; it is also the current limit recommended by CSA for exposed concretes. The results are discussed in terms of individual rock types in the following sections. For purposes of discussion, the current CSA specification limits for expansion in the accelerated test are 0.04% at one year for Class A, B and C concretes, and 0.07% for Class D concrete.

Low values of the index number and high values of sensitivity to alkali content are indicative of reactive materials.

6.4.3.1 Argillitic Rocks, Siltstones, Mudstones

Two samples of these materials, R1 and R4, showed moderate expansions during the test. Their performance was very similar in all respects to the alkali silicate reactive control CG2, although all three pass the current CSA limits of 0.04% expansion at one year. The index value for those two samples is less than 5 kg/m^3 which is, in fact, somewhat less than that for the control (6.4 kg/m^3). The 38°C, 1.25% Na_2O prisms for these samples revealed some hairline cracking and white deposits on their surfaces at two years. The expansion rate has remained relatively constant over the two year test period. Based on a comparison with the control sample, these materials should be considered reactive.

The remaining argillites, R2 and R3, show only minor expansions after two years, and index numbers are approximately double those of the reactive materials. These would be judged non-reactive based on their performance under test.

It is worthy of note that expansion is in general continuing in all the argillites at the end of two years.

6.4.3.2 Schists

One schist, R5, has expanded to 0.038% in two years. The maximum rate of expansion has occurred between six months and 1.5 years. Again, the behaviour is similar to that of control CG2, and this material should be considered reactive on that basis.

The remaining schist, R6, shows only minor expansion at two years. Both schists show continuing expansion at the end of two years, similar to the argillites.

6.4.3.3 Greywackes

The greywackes were among the most expansive rock types tested. Specimen R7 was highly expansive with expansions, in fact, greater than any of the control specimens (0.316% at two years). The bulk of the expansion occurred between three and seven months. Both sets of prisms stored at 38°C showed extensive cracking and deposits. R7 was one of the few specimens in which the effect of test temperature was more pronounced that alkali content. Prisms with low alkali (0.94%) expanded more at 38°C than those with 1.25% alkali at 23°C. The index number was calculated to be 2.9, which was among the lowest of any rock tested.

Specimen R8 also showed excessive expansion of 0.081% at two years. These prisms showed extensive hairline cracking but much less deposit formation than R7. The main expansive phase occurred in the period 6-9 months. The index number is low and the sensitivity to alkali is high for the material, indicative of a reactive aggregate.

The remaining greywacke, R9, showed only minor expansion, 0.009% at two years, and the prisms show no visual evidence of reaction.

In general, all the greywackes in common with the argillites and schists show evidence of continuing expansion beyond the two-year period.

6.4.3.4 Quartzites

The two quartzites tested, R10 and R11, show minimal expansion at two years. In general, the expansion appears to have ceased at 1.5 years unlike the performance of the argillites, greywackes and schists. These rocks are non-reactive.

6.4.3.5 Silicic Volcanics

Several rock types were tested including silicic volcanics, rhyolites, and silicic lavas. In general, the expansions at two years were minimal, less than 0.015%. With the exception of R15, the expansions appear to have stopped at two years. These rocks would classify as non-reactive.

6.4.3.6 Granites

Three granites were tested and the expansion at two years was minimal, less than 0.015%. The index numbers are high, in the 10-12 range, and the sensitivity to alkali content low. In general, expansions appear to have ceased at two years. These rocks would be classified as non-reactive.

6.4.3.7 Gabbro/Basalt

These specimens, R20 and R21, are characterized by low expansions, less than 0.01 at two years, high index numbers and low sensitivity to alkali content. Expansions have ceased at two years, thus these rocks would be classified as non-reactive.

6.4.3.8 Limestones

Four limestones were tested, R22, 23, 24 and 25. Specimens R22 and R23 which are relatively pure, 99% calcite and 99% dolomite respectively, indicated minimal expansions less than 0.015% at two years. Expansion has ceased after two years as well. These materials would classify as non-reactive.

Both remaining limestones, R24 and R25, are impure. R24 has variable amounts of quartz and mica; it is 94% dolomite. In R25 the impurities are principally mica with minor quartz; it is 95% dolomite. Specimen R24 was found to be extremely reactive, again recording expansions of the same magnitude as the most expansive controls (0.27% at two years). The main expansive phase was from two to seven months. This sample also was seen to be temperature sensitive similar to R7 in that the low alkali (0.94%) high temperature specimens expanded more than the high alkali (1.25%) low temperature ones. This material has a low index number, 2.9, similar to R7 and shows a high sensitivity to the alkali content of the concrete, indicative of a very reactive material.

Specimen R25 showed considerable expansion, 0.023% at two years, when compared to other nonreactive rocks in the test program. It has shown a gradual expansion over time and both these limestones are indicating continuing expansion at two years. Sample R25 is considered to be slightly reactive but is well within currently accepted test limits.

6.4.3.9 Natural Gravels

Eight natural gravels had their coarse fraction tested. These samples were selected to be petrographically representative of gravel aggregates currently in use or that had been used in the past for concrete. Table 6.7 summarizes the expansion data and the percentages of potentially deleterious rock types contained in the gravels.

No gravel samples had expansions during the test which exceeded current CSA specification limits (0.04% at one year). Two samples, G7 and G8, were very similar in performance to control sample CG2 which was a slow expanding alkali silicate reactive material. Based on a comparison with CG2 specimens, G7 and G8 would be considered reactive. Both had expansions at two years similar to CG2 and the calculated alkali content to give an expansion of 0.04% at one year was also similar.

The remaining gravels would classify as non-reactive, although sample G1 had a two year expansion similar to G7 and G8. However, it is not as sensitive to alkali content of the concrete as the latter two specimens.

A review of the petrographic characteristics of these aggregates indicates that the prism expansion is roughly proportional to the percentage of greywacke, and that the other potentially deleterious materials have a less well defined relationship to expansion. Increasing percentages of argillite actually show a reasonably linear trend to decreasing prism expansion.

6.4.4 Petrography of Selected Prisms

Fourteen prisms were selected from the 38°C, 1.25% alkali suite for detailed petrographic study upon completion of the two year expansion measurements. Detailed results of the petrographic work are included in Appendix I and summarized herein.

TABLE 6.7

SUMMARY OF EXPANSION TEST RESULTS AND PETROGRAPHY NATURAL GRAVELS

Sample No.	38°C Prism Exp. @ 2 Yr %	I kg/m^3	Greywacke %	Argillite %	Quartzite %	Silic Volc %	Phyllite & Schist %	Total Deleterious %
G1	0.016	8.9	46	19	23	-		88
G2	0.010	15.2	16	50	-	-		66
G3	0.010	8.7	15	30	-	-		45
G4	0.009	9.7	14	11	-	12		37
G5	0.007	16.1	16	51	6	-		73
G6	0.008	12.0	-	28	19	-	23	72
G7	0.016	6.2	37	16	11	-	12	78
G8	0.020	6.5	25	15	-	39		79

The prisms were examined for gels, cracking and other features associated with reactive materials. Examination of particles and deposits was performed with a stereomicroscope and an electron probe micro-analyser.

Alkali silica gels (Si-Na-K-Ca) were found in all prisms examined in widely varying amounts which correspond roughly with the actual prism expansion. Gels were found in the aggregate matrix; at aggregate-paste interfaces, in paste fractures and air voids, and on the surfaces of prisms. Qualitive amounts of gel are given in Table 6.8.

Crystalline forms of alkali silicates were also detected in aggregate and paste fractures and on prism surfaces; qualitative amounts are provided in Table 6.8. Petrographic evidence suggests that formation of these materials postdates deposition of gels.

Ettringite was found on aggregate paste interfaces, in paste fractures and air voids and on prism surfaces.

Calcium carbonates and oxides were located on aggregate paste interfaces, in paste fractures and air voids and in prism surfaces.

Crystalline Ca-K-Na-Cl silicates in trace amounts were found on aggregate fractures.

Fracturing of aggregate particles, particularly in the greywackes and argillites was found in all specimens and is closely related to the amount of expansion. Reaction rims were found in all aggregate particles containing gels. The strongly expansive aggregates, (R7 and R24), developed reaction rims as thick as 1-2 mm, while the rims on moderately expanding argillites and greywackes were less than 0.2 mm thick. Reaction rims were also observed on particles free of alkali reaction products and fracturing of particles which are believed to be nonreactive.

TABLE 6.8

DETAILS OF PETROGRAPHY OF PRISM SPECIMENS

Specimen No.	Rock Type	38°C Prism Expansion 1 yr%	2 yr%	Alkali Sensitivity S	Index kg/m^3	Relative Silica Gel	Relative Crystalline Gel	Cracking Number	Free SiO_2	SiO_2/MgO Ratio	Comments
R1	meta argillite	0.017	0.028	0.02	5	10	30	31	24.3	6	
R2	" "	0.002	0.008	0.006	10	1	20	24	23.5	5.3	
R3	" "	0.006	0.008	0.007	8.5	1	20	22	24.0	5.6	
R4	" "	0.015	0.025	0.027	4.8	10	30	28	23.4	8.7	
R5	schist	0.019	0.038	0.026	4.7	5	20	-	-	-	
R6	"	-0.004	0.003	0.005	12.3	1	5	-	-	-	
R7	greywacke	0.302	0.314	0.255	2.9	100	70	79	36.8	14.2	virtually all particles reactive
R8	"	0.071	0.081	0.074	3.5	30	60	28	42.8	16.6	not all particles appear reactive
R9	"	0.001	0.009	0.009	8	1	-	7	21.6	5.8	
R24	limestone	0.259	0.271	0.227	2.9	100	70	84			virtually all particles reactive
G1	gravel	0.009	0.016	0.006	8.9	1	5	2			reactive particles are greywackes and argillites
G3	"	0.005	0.010	0.007	8.7	1	5	3			
G7	"	0.014	0.016	0.011	6.2	1	5	4			
G8	"	0.015	0.020	0.009	6.5	1	5	6			

The basic findings of the petrographic work on prism samples are presented in Table 6.8, together with the rock types and details of test expansion measurements.

Examination of the data in Table 6.8 indicates that there is a good correlation between the amount of cracking and prism expansion, especially for the argillites and greywackes. The relative amount of silica gel also correlates well with measured prism expansion. The relative amount of crystalline gel correlates less well with expansion, especially in the most expansive specimens, indicating that expansion is most closely related to silica gel formation. Good correlation was also found between the relative amount of silica gel and the sensitivity to alkali content.

There are also rough correlations between expansion and the free SiO_2 and SiO_2/MgO ratios.

Perhaps one surprising result of the petrographic study is the amount of cracking and internal damage in prisms cast with argillites R2 and R3, which show very little actual expansion under test.

Examination of the specimens cast with natural gravels indicated that particles of argillite and greywacke within the gravels were reactive.

One of the main purposes of petrographic examination of the prism concretes was to see if it was possible to distinguish features which would allow identification of reactive and nonreactive materials within the same rock types.

Certain particles of greywacke, argillite and argillaceous limestone produced silica gels under test and can be classified as reactive. Nonexpanding argillites and greywackes produced insignificant amounts of gel and would be classified non-expansive. Compositional and texural differences between reactive and nonreactive aggregates were not detected. However, there were indications that a combination of modal content of matrix size quartz and phyllosilicates was responsible for deleterious reactions. The rate of absorption of alkaline solution into reactive aggregate must also be a factor which controls the rate of reaction. The fact that, in general, only the high temperature prisms expanded, implies a chemical nature to the reaction in which silica is supplied by the reactive particles.

The behaviour of the schists is similar in that texurally and compositionally, some of the material in both specimens resembles reactive greywacke; however, only R5 appears to be expansive.

It is also worthy of note that almost all of the argillites, schists and greywackes, including those judged non-reactive on the basis of current specification limits, are continuing to show very slow expansions at two years, whereas all the other rock types have, in general, stopped expanding.

6.5 Standard Mortar Bar Tests (ASTM C227)

6.5.1 General

Standard mortar bar tests were carried out on all specimens of argillites, schists, greywackes, quartzites and silic volcanic rocks on which prism tests were conducted. No mortar bar tests were carried out on the granites, basalts or limestone specimens.

Fifteen samples of natural sand from throughout the Province were also tested. These are representative petrographically of sands currently in use for concrete manufacture.

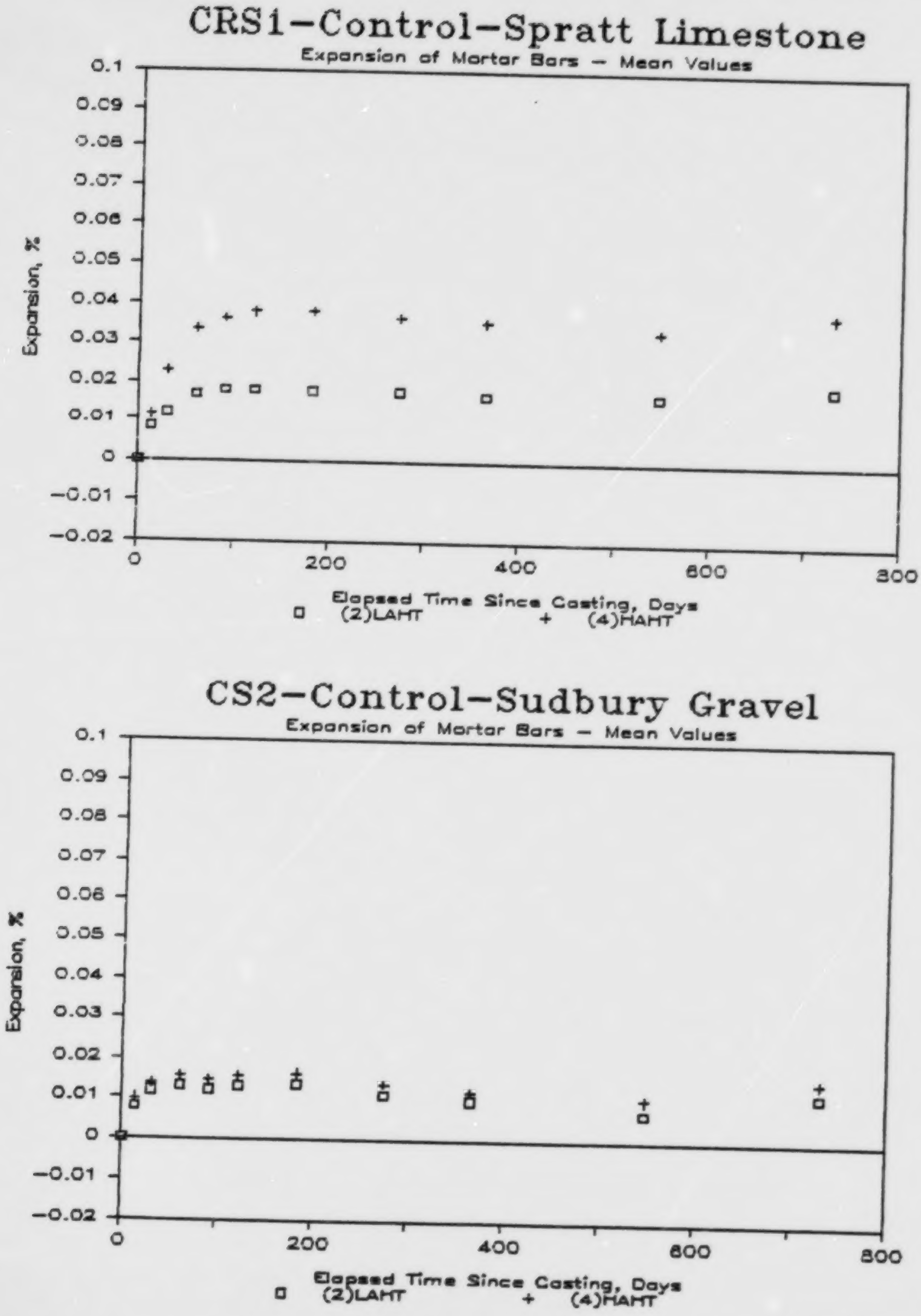
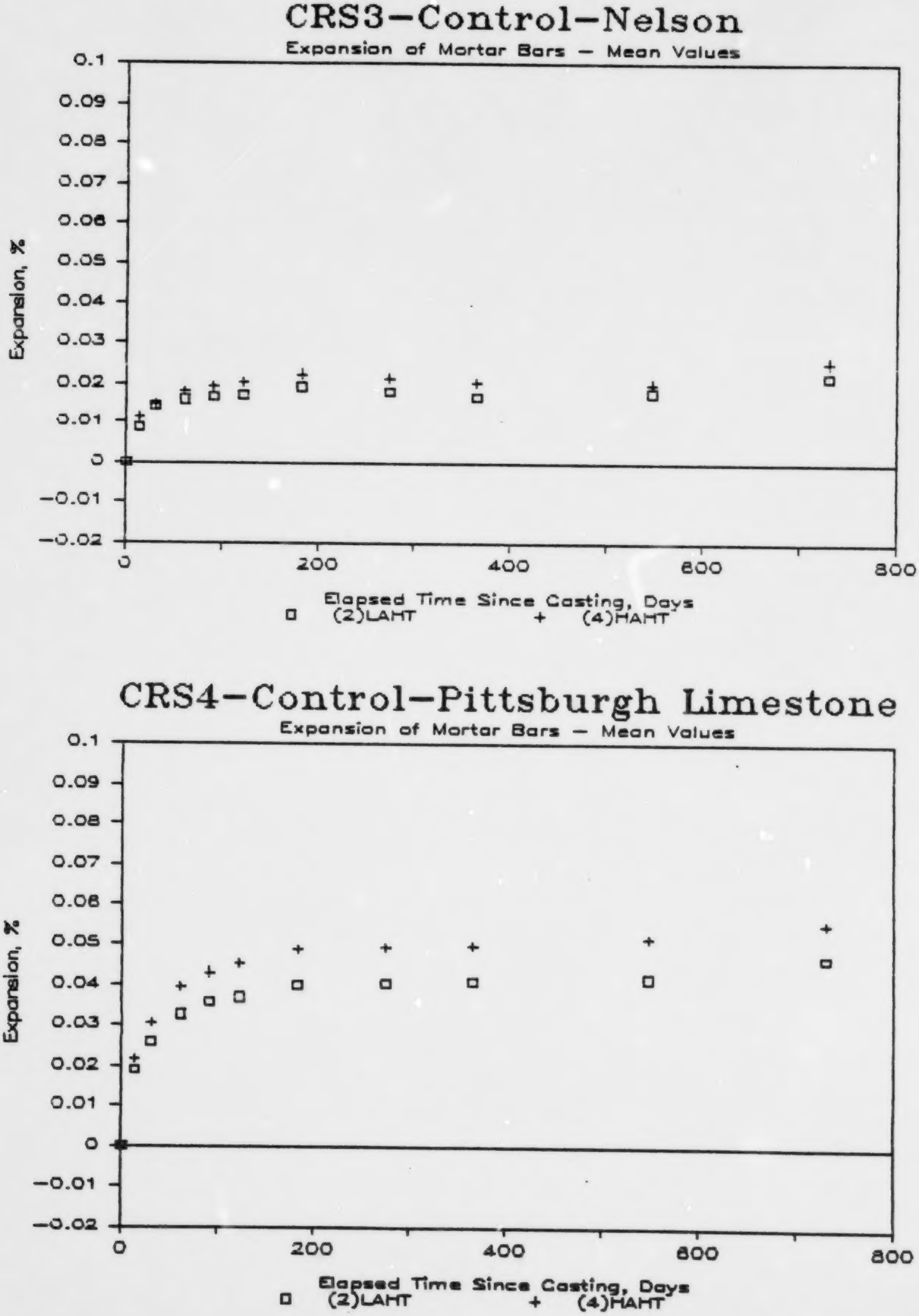

CRS1-Control-Spratt Limestone
Expansion of Mortar Bars - Mean Values
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
Expansion, %
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT
CS2-Control-Sudbury Gravel
Expansion of Mortar Bars - Mean Values
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
Expansion, %
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

Fig. 6.9



CRS3–Control–Nelson

Expansion of Mortar Bars – Mean Values

CRS4–Control–Pittsburgh Limestone

Expansion of Mortar Bars – Mean Values

Fig. 6.10

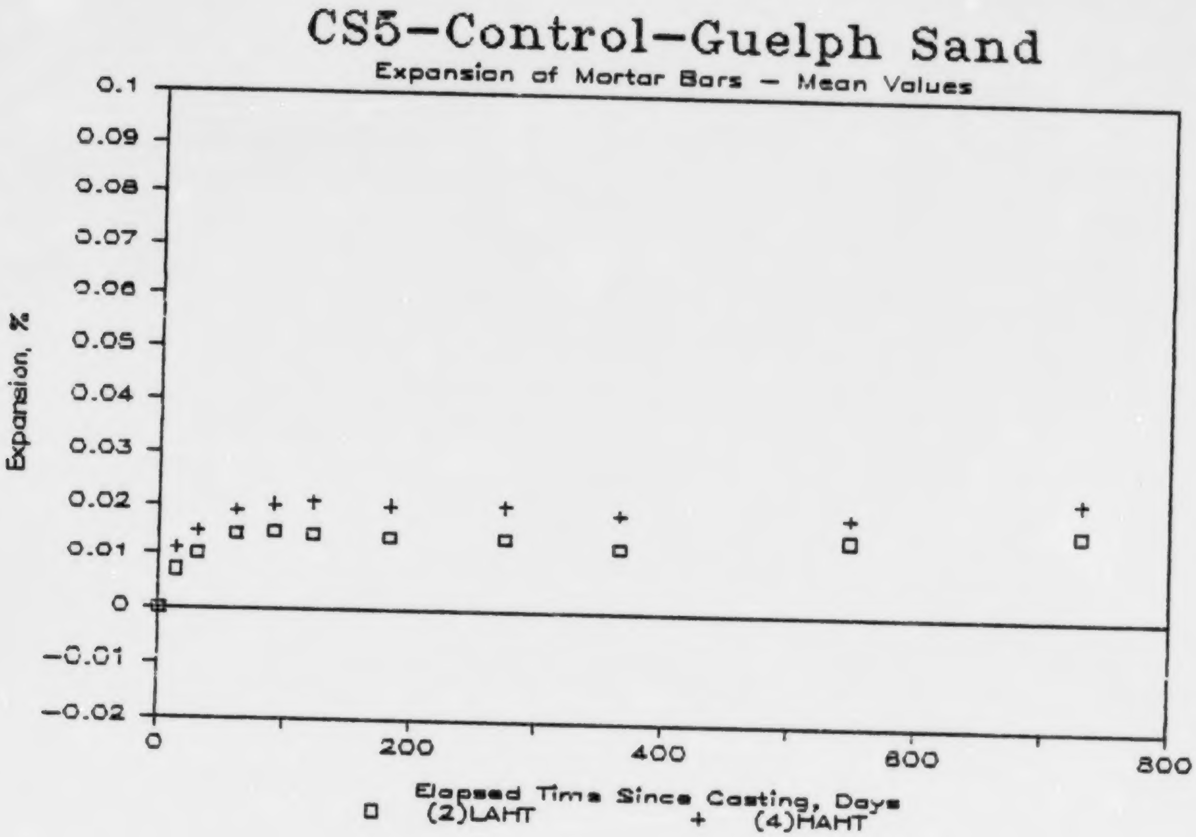

CS5-Control-Guelph Sand
Expansion of Mortar Bars - Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

Fig. 6.11

In addition, five control specimens were tested including the four materials used as controls in the prism test program plus the Guelph sand which had been used as the fine aggregate in all prism testing.

All specimens were tested at two alkali contents, 0.94% Na_2O and 1.25% Na_2O.

The complete test results in tabular form are presented in Appendix H, and in graphical form in attached Appendix 1.

6.5.2 Control Specimens

Plots of expansion vs time for the five control specimens are presented in Figs. 6.9, 6.10 and 6.11. In general, the alkali silica reactive control, CRS1, did not perform as expected and, in fact, passed the current test specification limits (0.05% at 3 months, 0.10% at 6 months). This sample did expand significantly more than any of the test program specimens and also exhibited a much higher sensitivity to changes in alkali content. This specimen also gave the highest initial rate of expansion by far of any of the specimens.

The nonreactive controls CS5, Guelph sand and CRS3, Nelson limestone, did not expand significantly as would be expected for nonreactive material.

The carbonate reactive specimen gave the most expansion but was still within specified limits, although the mortar bar test is not recommended for this type reaction.

The Sudbury control, an alkali-silicate reactive material, did not respond to the mortar bar test.

Table 6.9 illustrates typical control mortar bar expansions as compared to results obtained on the same materials by the Ontario Ministry of Transportation and Communications.

In general, the study results for the Spratt material are similar to those found at MTC for the 1987 ASTM containers. These containers, however, may be altering (in fact, reducing) mortar bar expansion due to the extremely humid atmosphere, resulting in leaching of alkalis from the mortar bars. This phenomenon has been previously discussed in Section 3.4.3 and illustrated on Figure 3.1.

Results for the Guelph sand are about 30 percent lower expansion at 112 days with virtual cessation of movement at 84 days. In contrast, the MTC specimens continued to expand slightly up to at least one year.

6.5.3 Summarized Test Results

Typical expansion versus time plots for several of the typical specimens are presented in Figs. 6.12-6.16. Graphs for all materials tested are presented in Appendix 1.

Test data are summarized in Table 6.10.

Examination of the data in Table 6.10 indicates that none of the New Brunswick samples remotely approached the behaviour of the alkali silica control (CRS1) or the alkali carbonate control (CRS4). Both these materials exhibited total expansions that were at least double or triple those of the test specimens. In addition to the parameter of total expansion, the sensitivity to alkali and the initial rate of expansion for these two materials is at least double that of any of the New Brunswick materials.

TABLE 6.9

COMPARATIVE EXPANSION RESULTS
MORTAR BAR CONTROL SPECIMENS

		MTC Results		Study Results	
Material	Time Days	Pre 1987 ASTM Containers	1987 ASTM Containers	Expansion % 1987 ASTM ASTM Containers	
Spratt		1.17% Na_2O	1.17% Na_2O	0.92% Na_2O	1.25% Na_2O
CRS1	28	0.017	.015	0.012	0.023
	56	0.040	.024	0.017	0.033
	84	0.064	.032	0.018	0.036
	112	0.067	.033		
	168	0.071	.035	0.018	0.038
	252				
	365			0.017	0.036
Guelph Sand		1.25% Na_2O			1.25% Na_2O
CS5	28	0.016			0.015
	56	0.029			0.019
	84	0.027			0.020
	112	0.029			0.021
	168	0.035			0.020
	365	0.037			0.019

TABLE 6.10

SUMMARY OF STANDARD MORTAR BAR TEST RESULTS

Specimen No.	Material	1 Year Expansion %		S1*	2 Year Expansion %		S2*	R** x 10^4
		0.94% Na_2O	1.25% Na_2O		0.94% Na_2O	1.25% Na_2O		
RS1	meta argillite	0.010	0.020	.01	0.016	0.022	0.006	3.9
RS2	" "	0.010	0.011	–	0.013	0.015	0.002	1.7
RS3	" "	0.004	0.008	0.004	0.008	0.011	0.003	2.3
RS4	" "	0.006	0.012	0.006	0.009	0.014	0.005	3.5
RS5	schist	0.010	0.017	0.007	0.013	0.017	0.004	2.4
RS6	"	0.010	0.018	0.008	0.011	0.020	0.009	1.8
RS7	greywacke	0.013	0.016	0.003	0.016	0.020	0.004	2.4
RS8	"	0.006	0.014	0.008	0.011	0.016	0.005	1.9
RS9	"	0.008	0.014	0.006	0.011	0.016	0.005	1.2
RS10	quartzite	0.012	0.015	0.003	0.013	0.017	0.004	2.8
RS12	silic volc	0.015	0.010	−0.005	0.018	0.012	−0.004	2.8
RS13	" "	0.009	0.011	0.002	0.009	0.012	0.003	2.4
RS14	" "	0.006	0.010	0.004	0.009	0.013	0.004	2.4
RS15	" "	0.011	0.009	−0.002	0.013	0.012	−0.001	2.4
RS16	" "	0.009	0.011	0.002	0.012	0.013	0.001	2.9
S1	natural sand	0.011	0.012	0.001	0.015	0.015	–	2.9
S2	" "	0.011	0.016	0.005	0.016	0.019	0.003	3.3
S3	" "	0.010	0.020	0.010	0.014	0.022	0.008	3.1
S4	" "	0.010	0.015	0.005	0.015	0.018	0.003	2.2
S5	" "	0.013	0.014	0.001	0.015	0.016	0.001	2.2
S6	" "	0.015	0.021	0.006	0.016	0.021	0.005	1.2
S7	" "	0.015	0.016	0.001	0.016	0.016	–	2.4
S8	" "	0.011	0.015	0.004	0.010	0.015	0.005	1.2

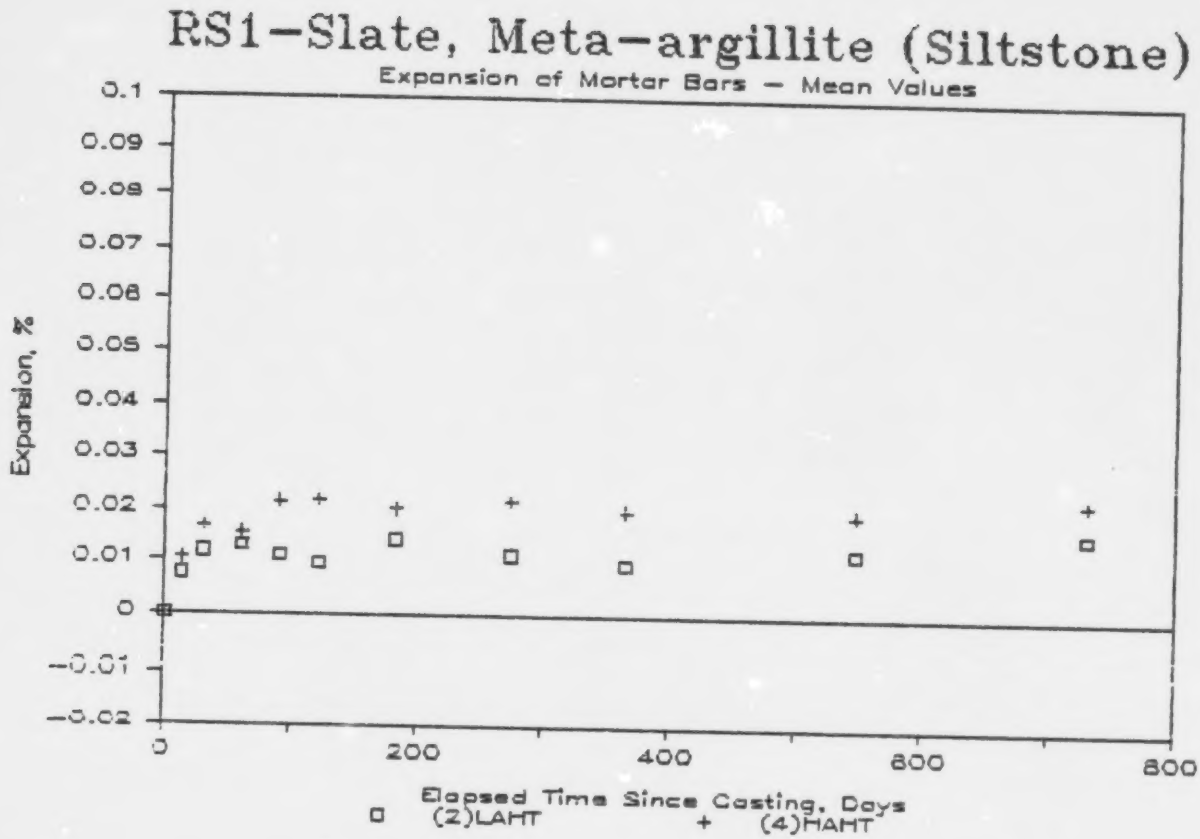
TABLE 6.10 (continued)

Specimen No.	Material	1 Year Expansion %		S1*	2 Year Expansion %		S2*	R** x 10^4
		0.94% Na_2O	1.25% Na_2O		0.94% Na_2O	1.25% Na_2O		
S9	natural sand	0.015	0.019	0.004	0.815	0.018	0.003	1.2
S10	" "	0.014	0.017	0.003	0.014	0.015	0.001	1.8
S11	" "	0.016	0.018	0.002	0.017	0.021	0.004	1.2
S12	" "	0.022	0.026	0.004	0.029	0.025	0.004	0.6
S13	" "	0.007	0.012	0.005	0.010	0.015	0.005	0
S14	" "	0.008	0.011	0.003	0.013	0.016	0.003	0
S15	" "	0.013	0.014	0.001	0.015	0.017	0.002	1.1
CRS1	silica reactive limestone	0.017	0.036	0.019	0.019	0.038	0.019	7.1
CRS2	reactive gravel	0.010	0.012	0.002	0.012	0.015	0.003	2.4
CRS4	carbonate reactive	0.041	0.050	0.009	0.047	0.055	0.008	5.6
CRS3	nonreactive limestone	0.017	0.020	0.003	0.022	0.025	0.003	1.9
CS5	nonreactive sand	0.012	0.019	0.007	0.016	.023	0.007	2.4

* S1 is the increase in expansion at one year resulting from increased alkali content

* S2 is the increase in expansion at two years resulting from increased alkali content

**R is rate of expansion in % per day for the period 14-32 days


RS1-Slate, Meta-argillite (Siltstone)

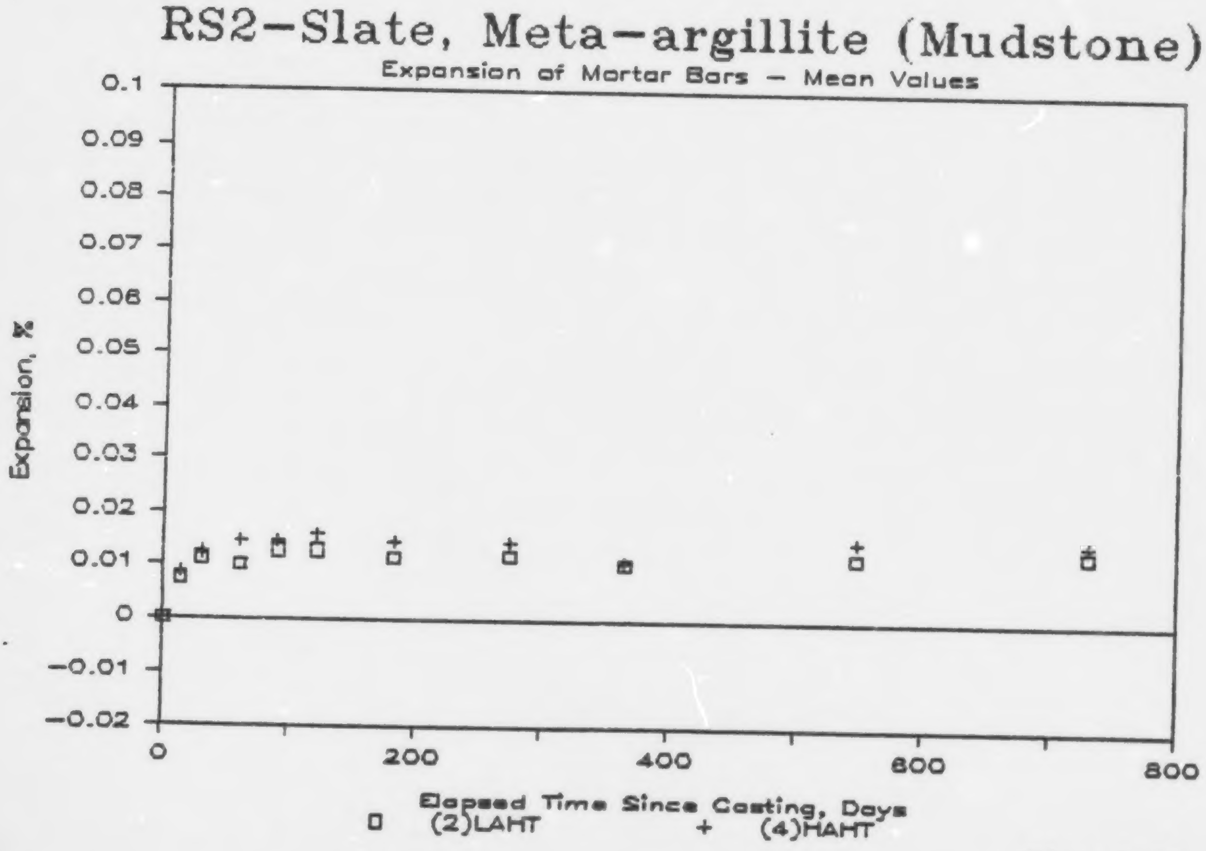
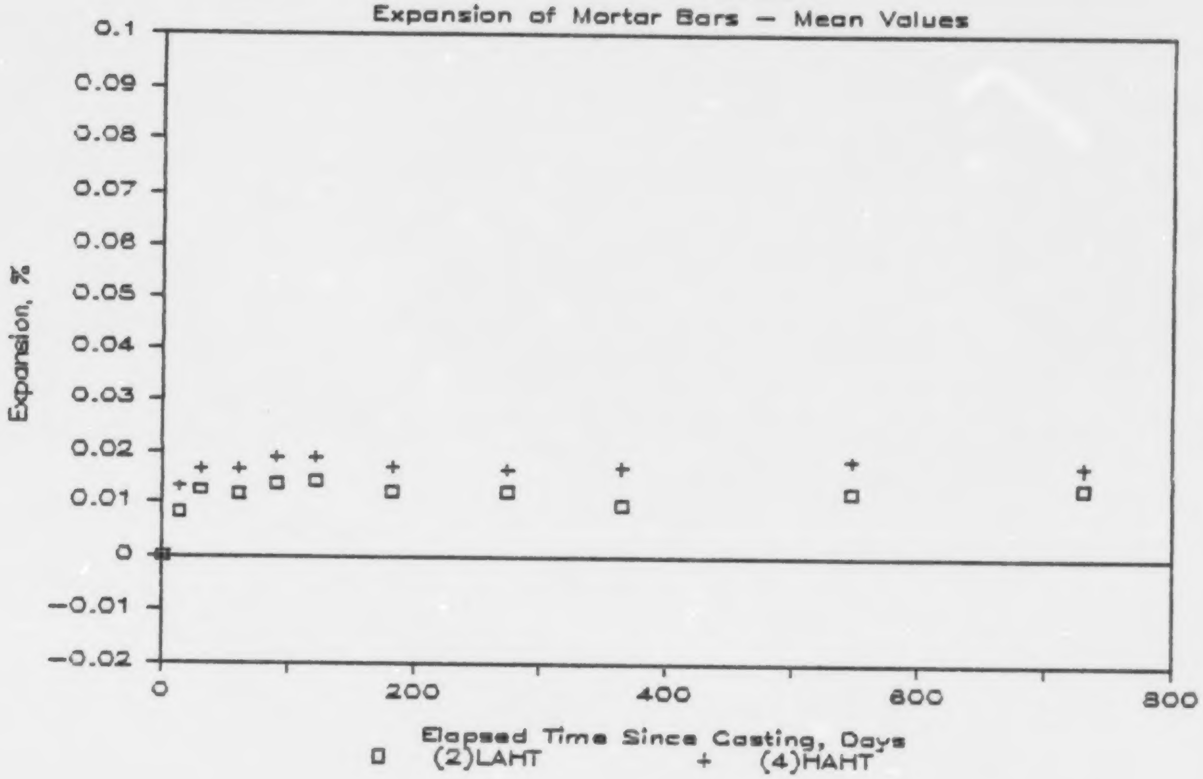

RS2-Slate, Meta-argillite (Mudstone)

Fig. 6.12

RS5-Schist

Expansion of Mortar Bars — Mean Values



RS6-Schist

Expansion of Mortar Bars — Mean Values

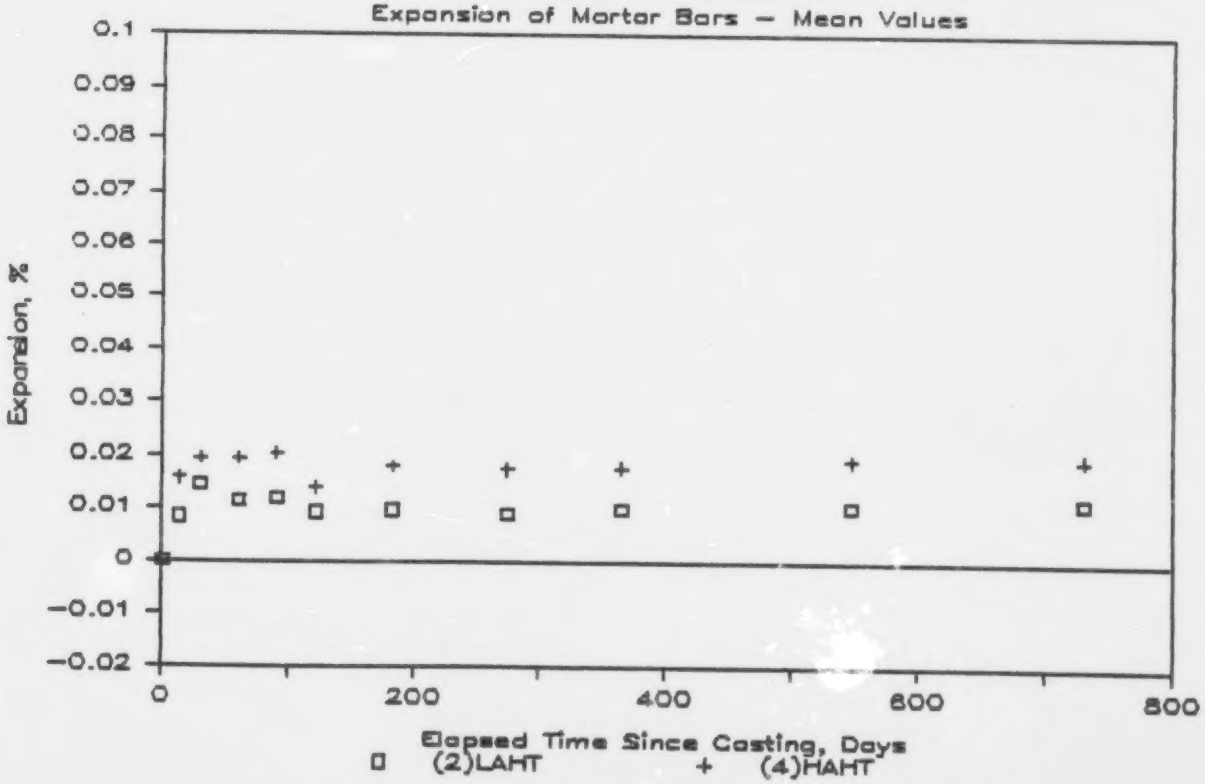


Fig. 6.13

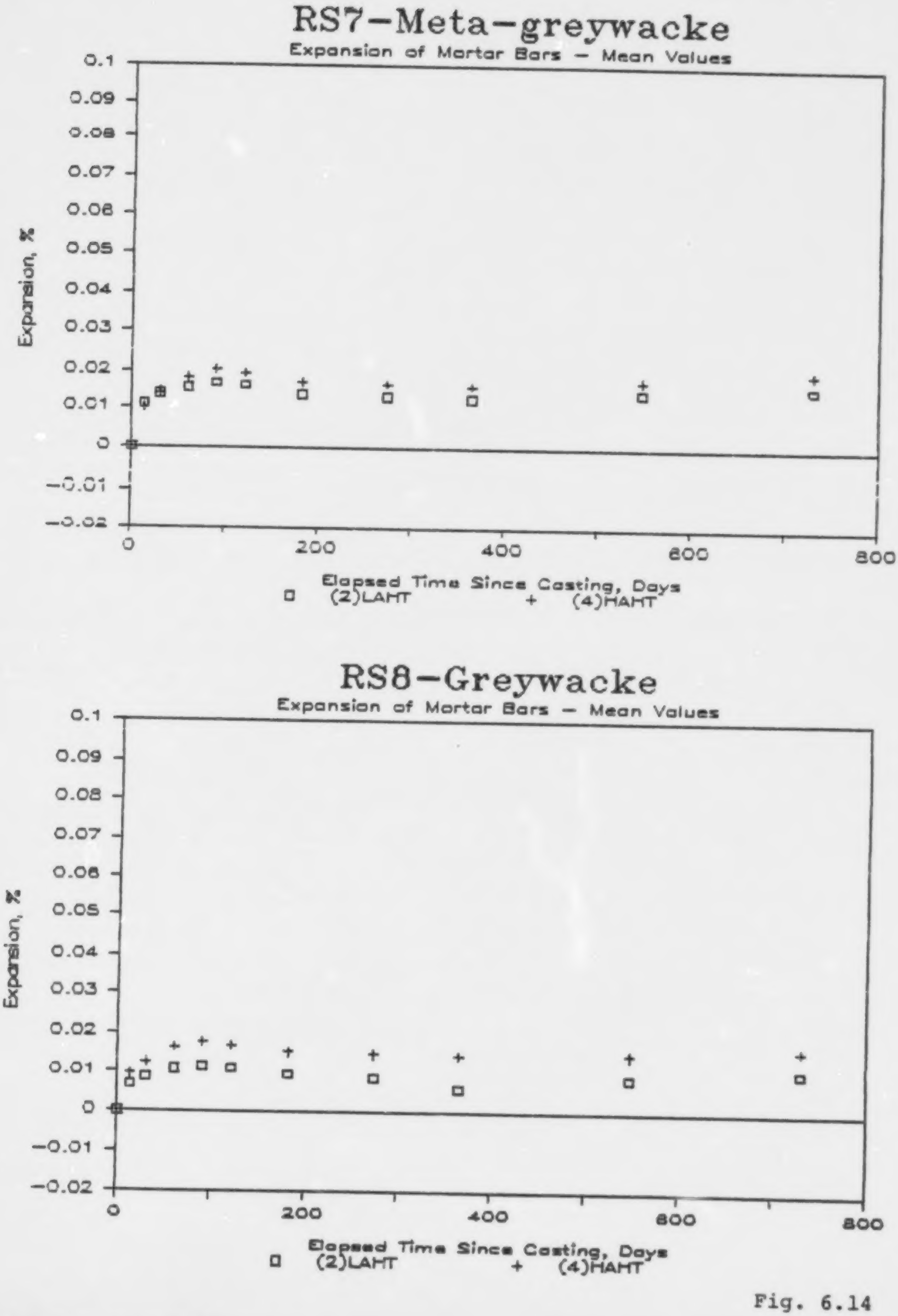
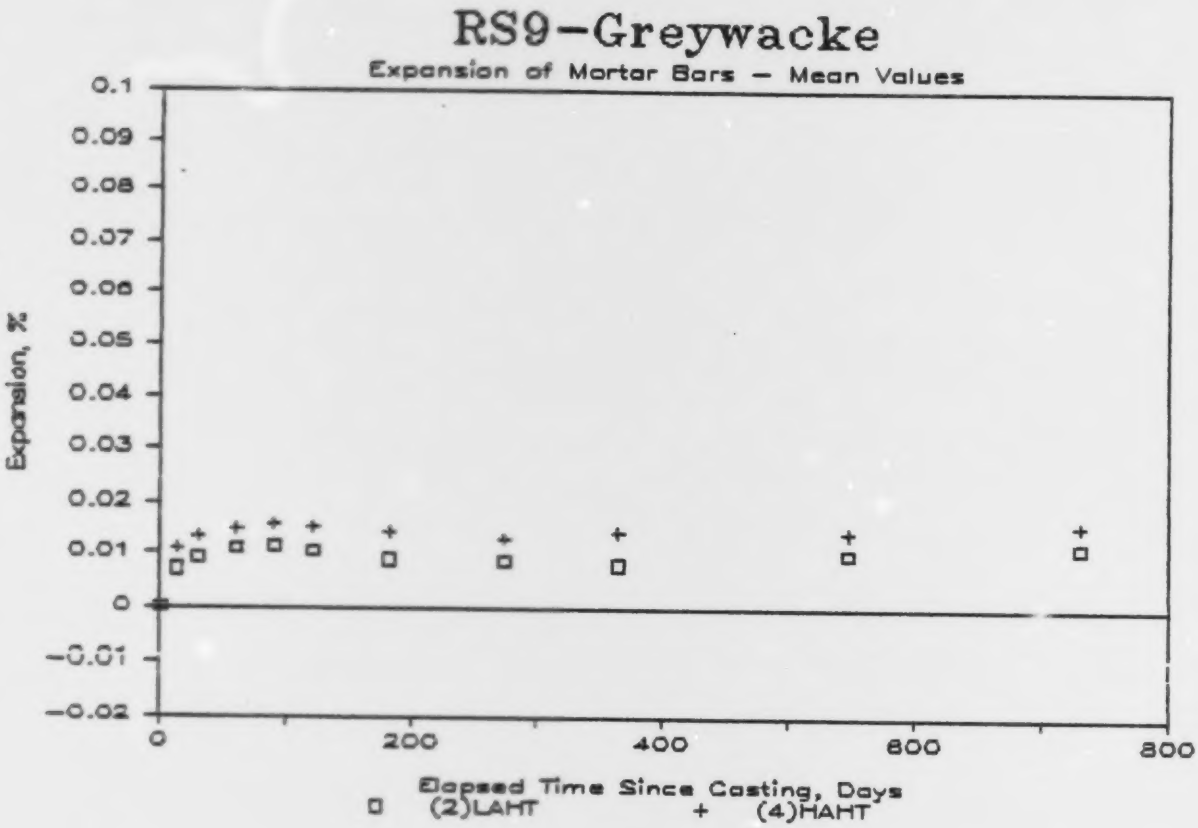

RS7–Meta–greywacke
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT
RS8–Greywacke
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

Fig. 6.14


RS9-Greywacke
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

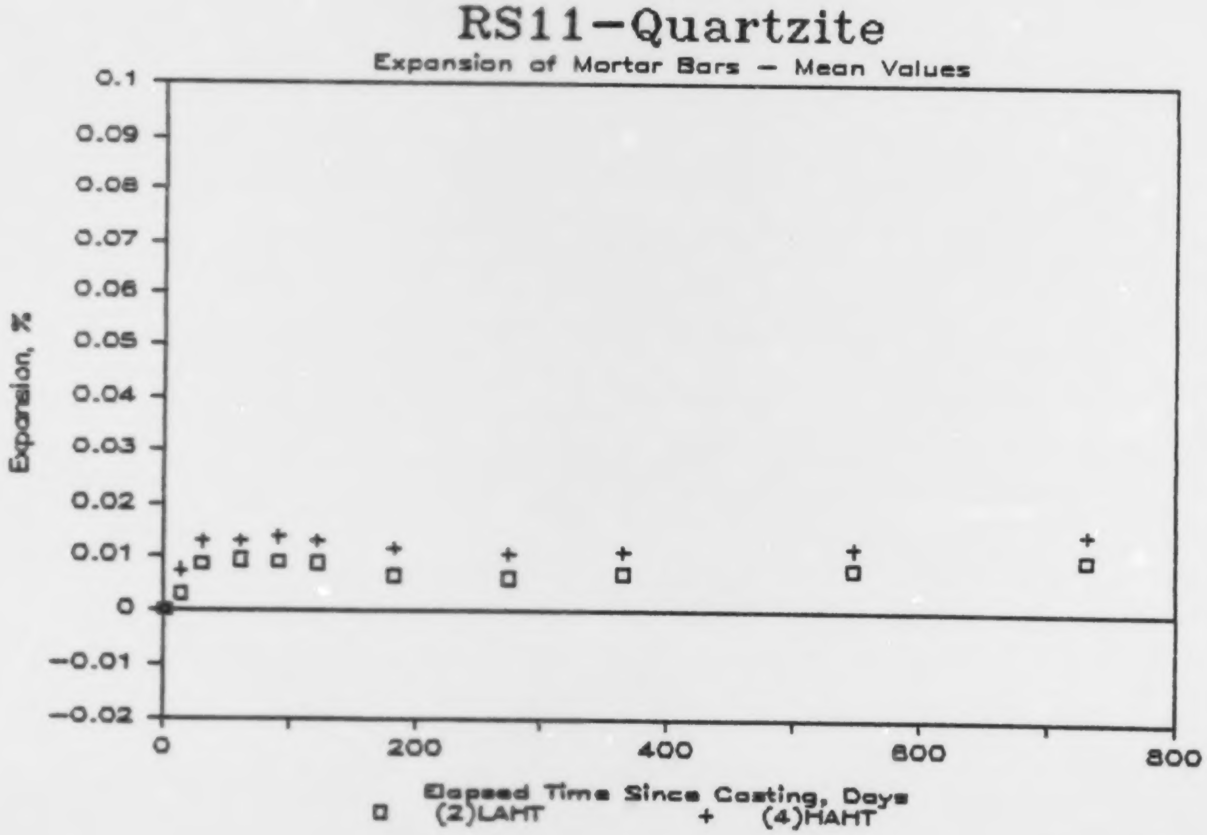
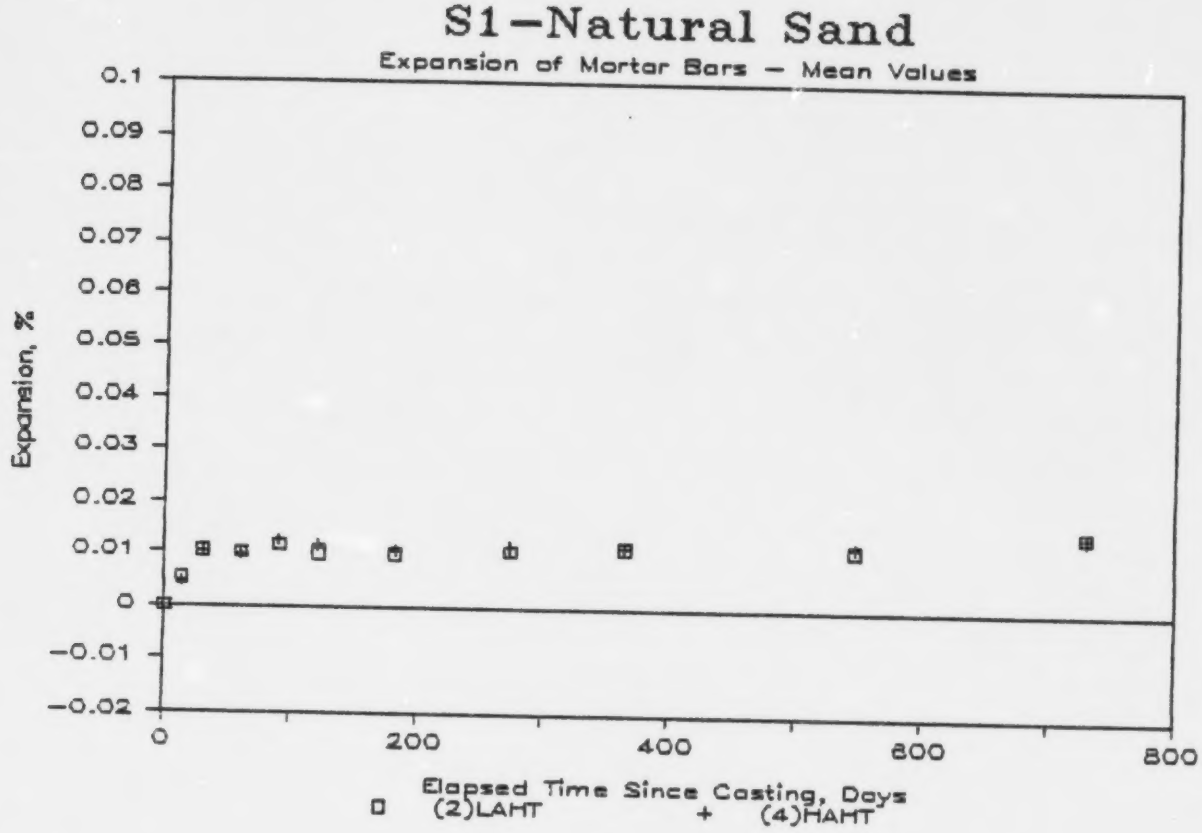
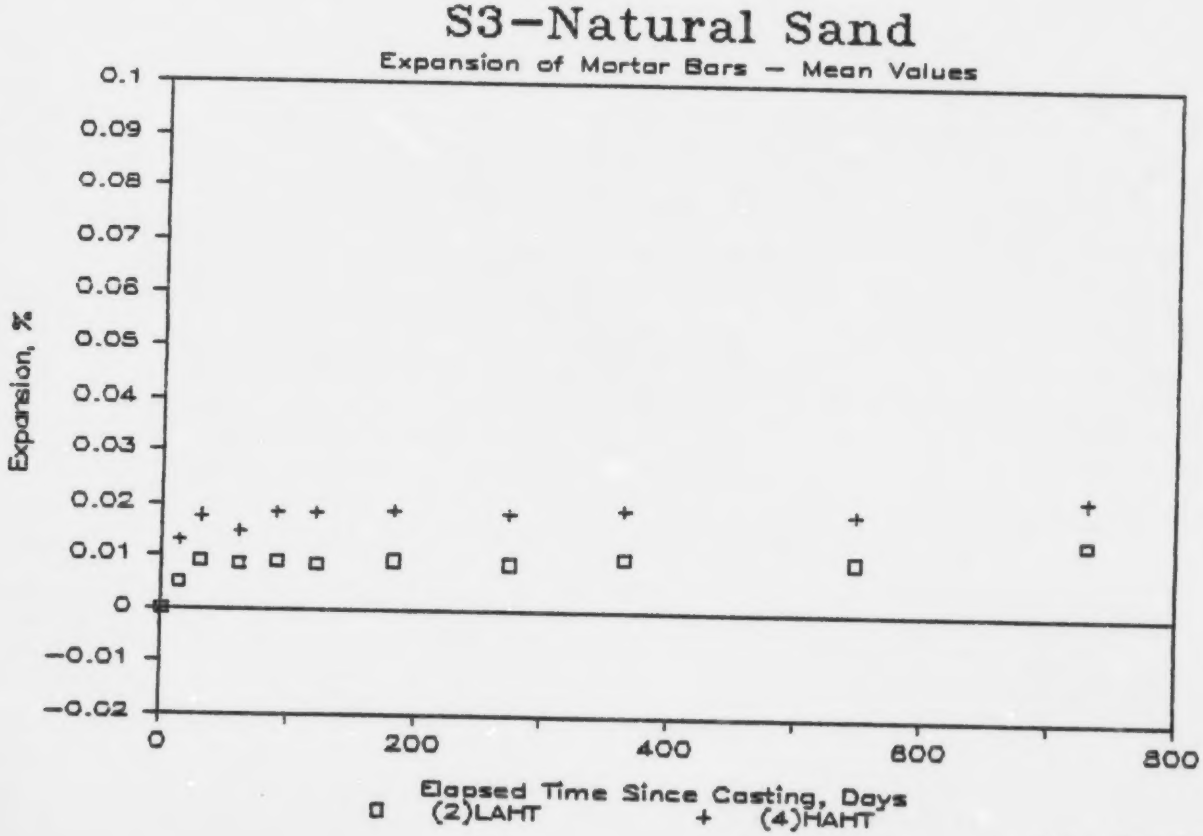

RS11-Quartzite
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

Fig. 6.15



S1–Natural Sand

Expansion of Mortar Bars – Mean Values



S3–Natural Sand

Expansion of Mortar Bars – Mean Values

Fig. 6.16

It was reasoned that if leaching of alkalis occurs in the test containers, the initial rate of expansion would be the parameter least affected, and therefore would provide an indication of expansion potential by comparing it with the potential reactivity of control specimens.

There is no recognizable relationship between mortar bar expansions and the individual components of the aggregates tested.

It can be concluded with reasonable certainty that none of the materials tested is alkali-silica reactive. However, the mortar bar may fail to identify alkali-silicate reactive materials and this is the type of reaction that would be expected with the New Brunswick aggregates.

It is also concluded that the 1987 ASTM containers may adversely affect the test results through some mechanism.

6.6 Accelerated Mortar Bar Tests

6.6.1 General

Accelerated mortar bar tests were carried out on thirteen aggregates including all the argillites and greywackes, one schist and one limestone which had been previously tested in the prism and standard mortar bar programs. In addition, four of the gravels were tested. The cement used in this test series was from the same producer but had a slightly reduced alkali content, 0.92%, as opposed to 0.94% used in the prism and standard mortar bar tests.

The complete test results in tabular form are presented in Appendix H.

Basically, the accelerated mortar bar test is similar to the standard ASTM test with the exception of storage conditions. The mortar bars are stored immersed in 1N NaOH at a temperature of 80°C and expansion measurements obtained at one day intervals for a period of 12 days after casting.

Davies and Oberholster (44) have proposed the following limits for the accelerated mortar bar test:

Expansion % at 14 Days	Potential for Reaction
0.10	innocuous
0.10-0.25	potentially deleterious slowly expansive
greater than 0.25	potentially deleterious rapidly expansive

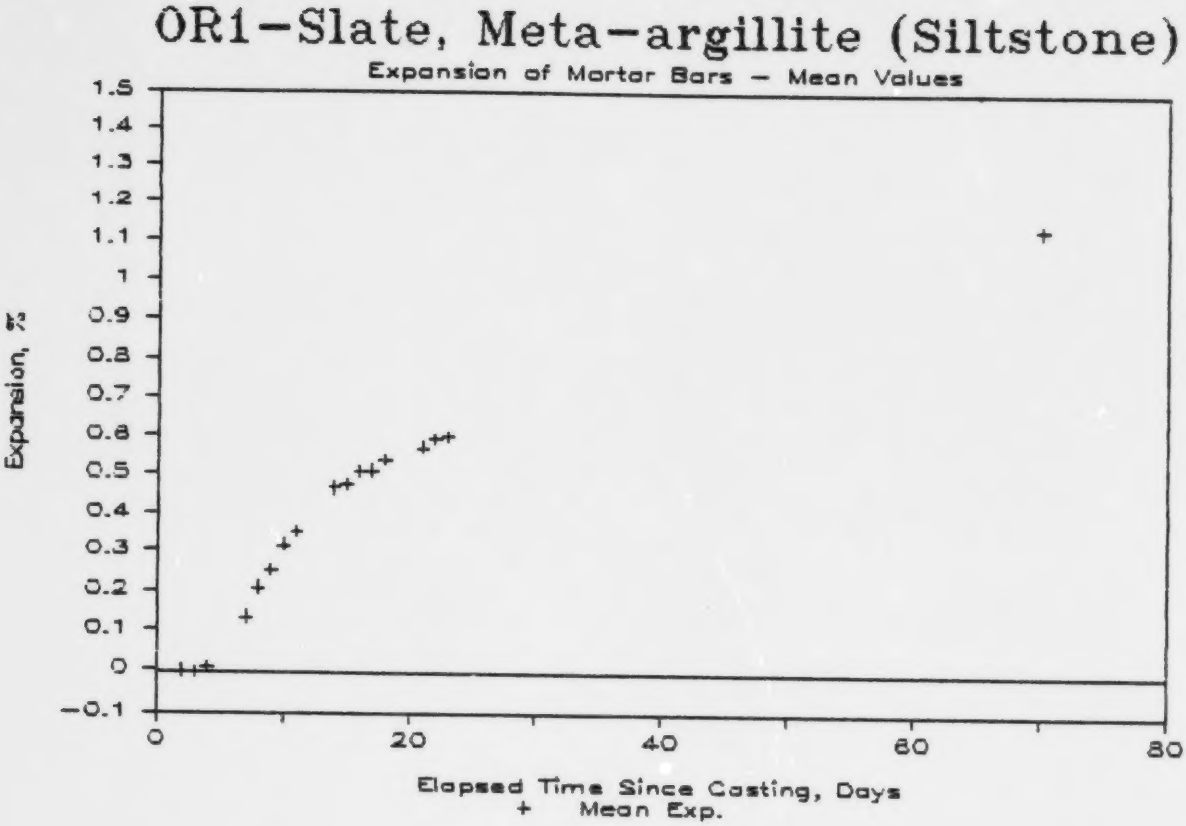
6.6.2 Summarized Test Results

The expansion time plots for the accelerated mortar bar tests are given in Figs. 6.17-6.23.

The results are summarized in Table 6.11 together with details of aggregate types and results from the other test series on the same materials.

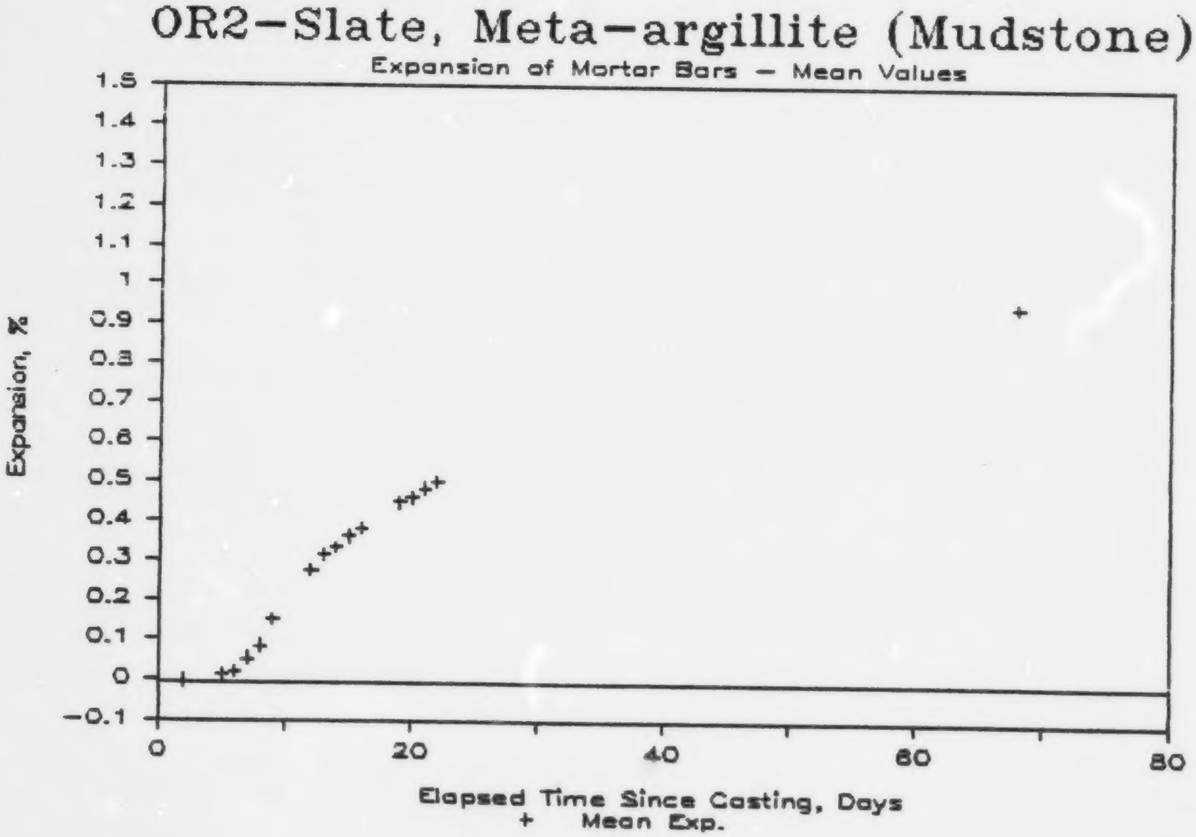
A comparison of the accelerated prism expansion data with the suggested limits would indicate that all materials tested classify as expansive and that twelve of the thirteen classify as rapidly expansive.

It can also be quickly appreciated that there is a poor correlation between expansive aggregates as determined in the



OR1-Slate, Meta-argillite (Siltstone)

Expansion of Mortar Bars - Mean Values



OR2-Slate, Meta-argillite (Mudstone)

Expansion of Mortar Bars - Mean Values

Fig. 6.17

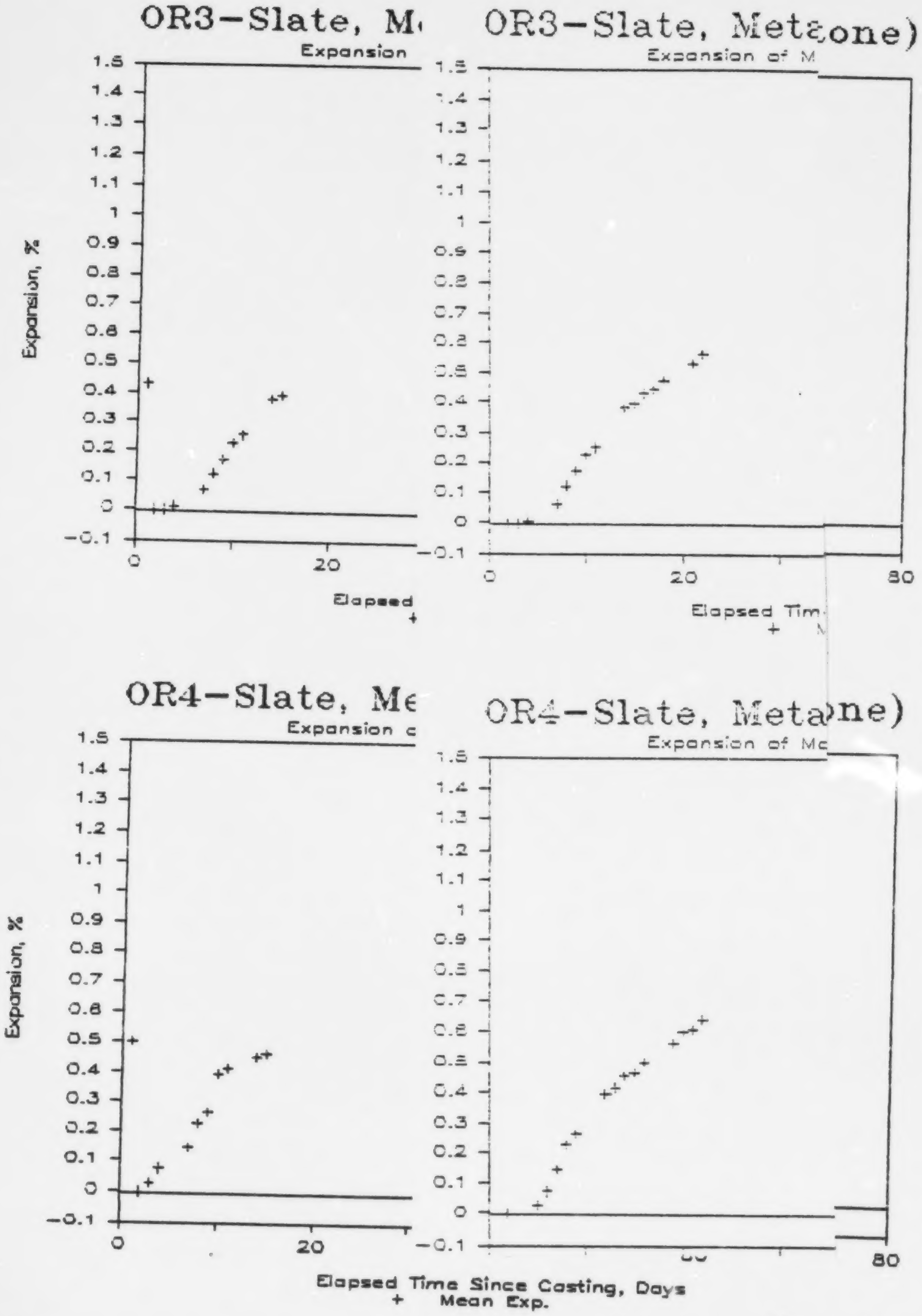

OR3−Slate, M
Expansion
OR3−Slate, Metaone)
Expansion of M
OR4−Slate, Me
Expansion c
OR4−Slate, Metaone)
Expansion of Mc
Expansion, %
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
−0.1
0
20
80
Elapsed
Elapsed Tim
Elapsed Time Since Casting, Days
+ Mean Exp.

Fig. 6.18

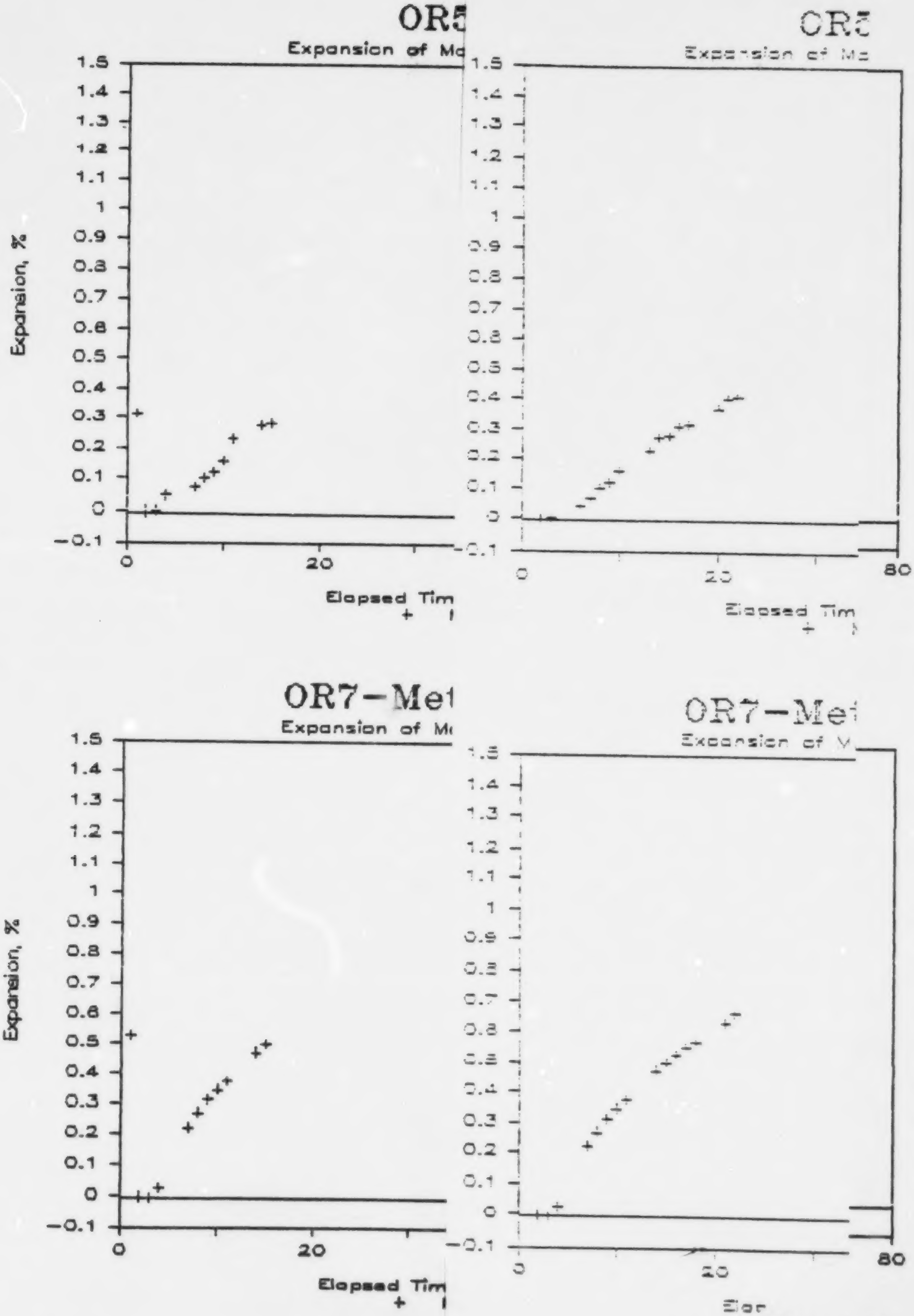
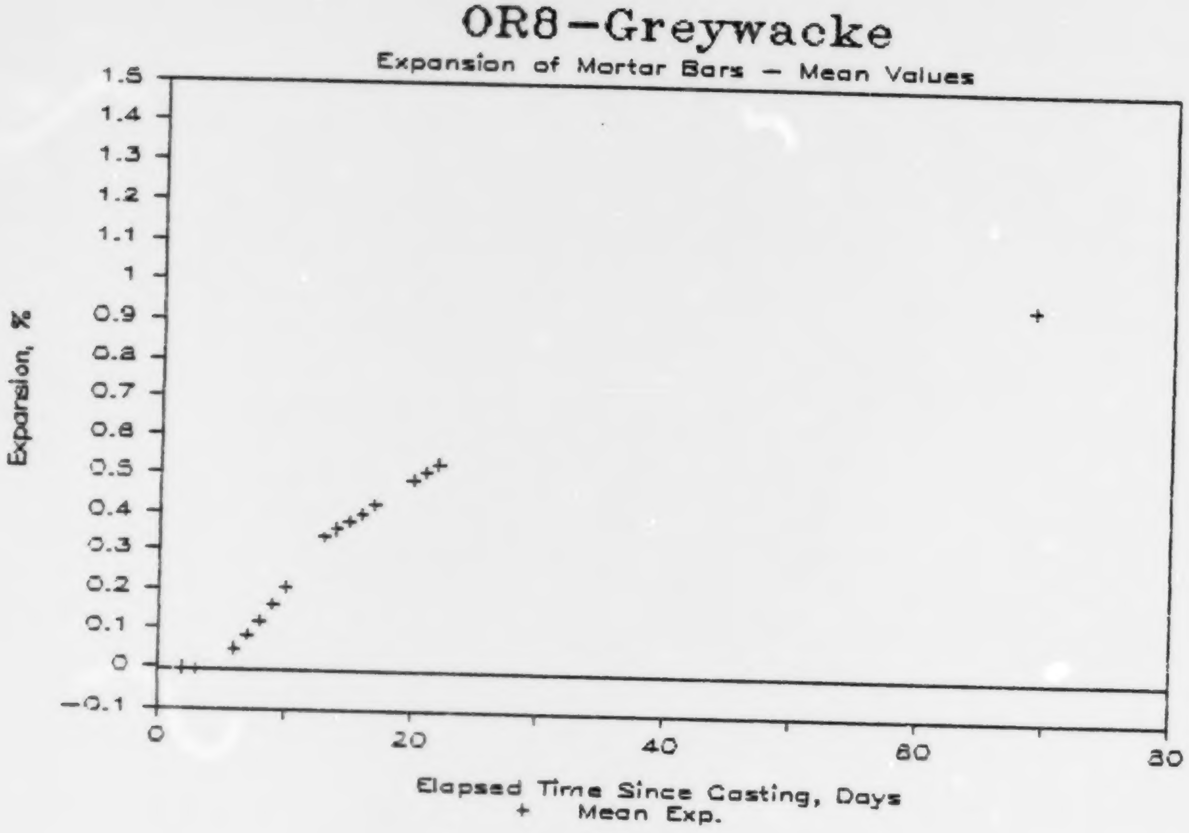

OR5
Expansion of Mo
Expansion, %
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
−0.1
0
20
Elapsed Tim
+
OR5
Expansion of Mo
0
20
80
Elapsed Tim
+
OR7−Met
Expansion of Mo
Expansion, %
0
20
Elapsed Tim
+
OR7−Met
Expansion of M
0
20
80
Elap

Fig. 6.19


OR8-Greywacke
Expansion of Mortar Bars - Mean Values
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
Expansion, %
0
20
40
60
80
Elapsed Time Since Casting, Days
+ Mean Exp.

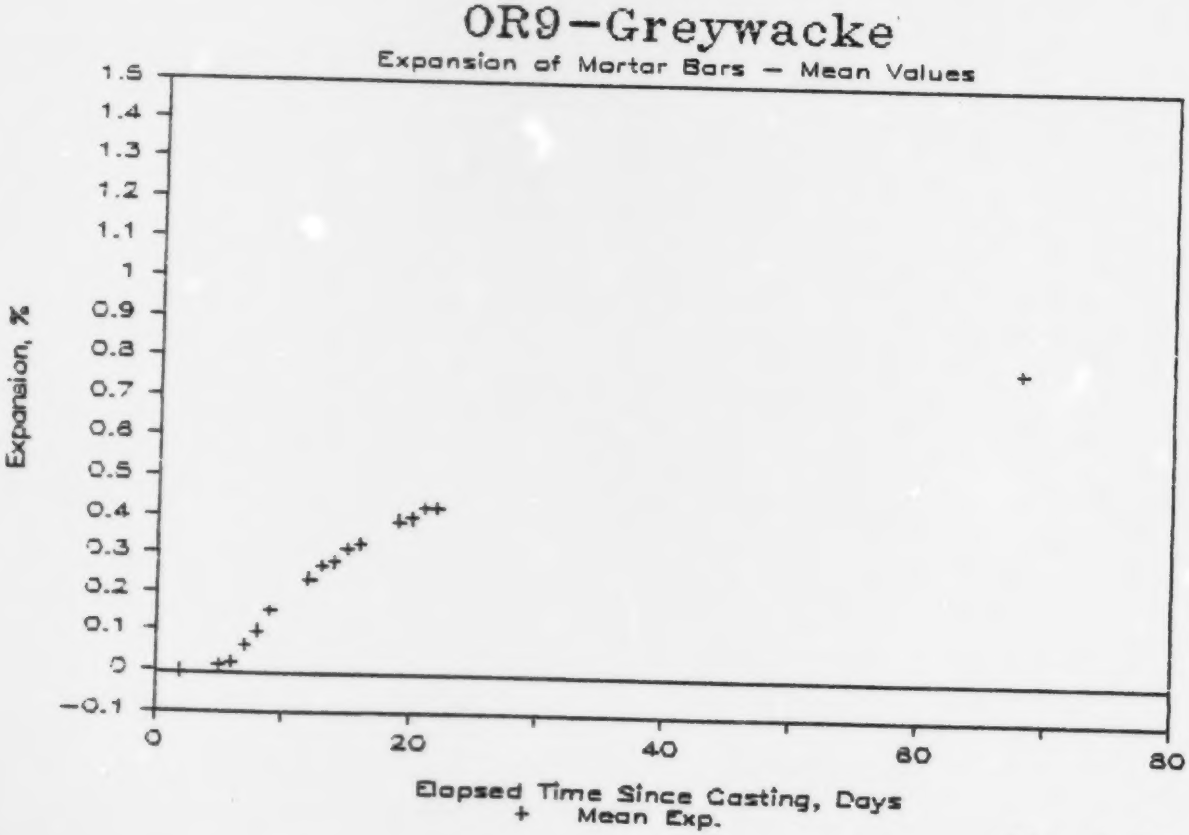
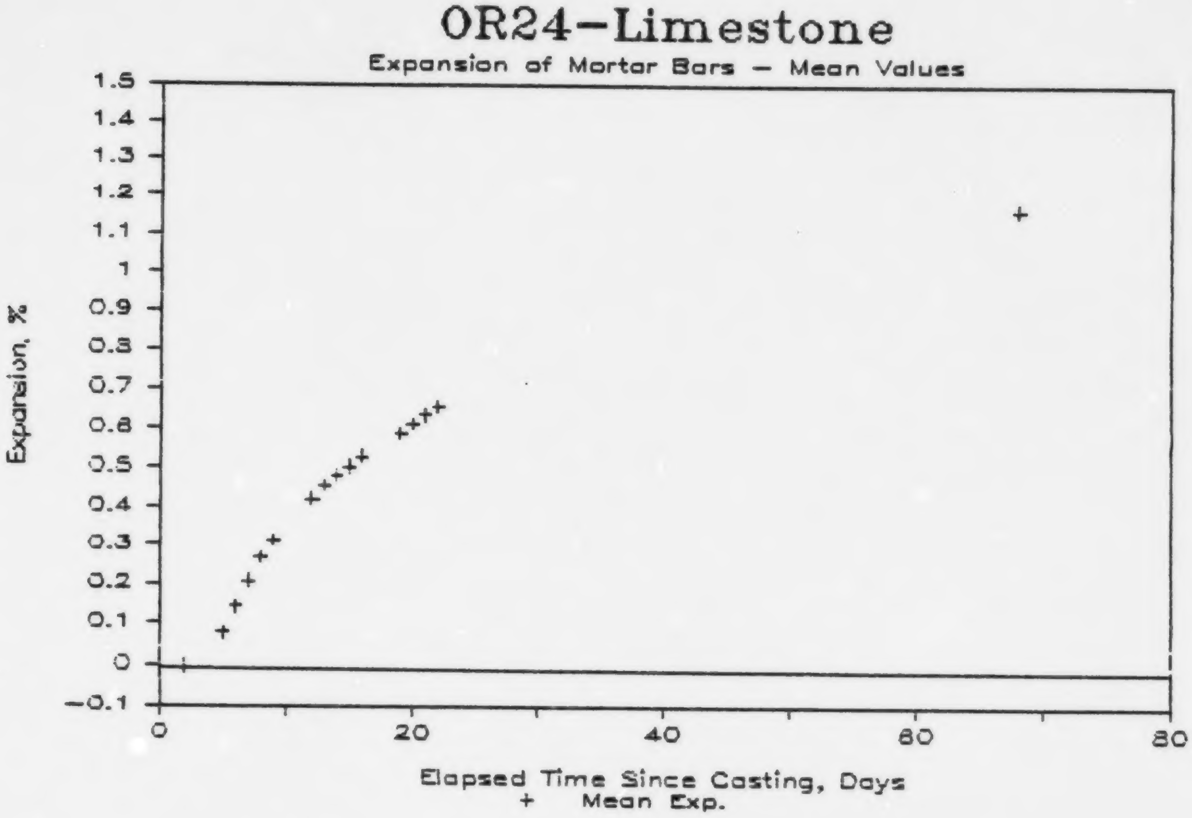

OR9-Greywacke
Expansion of Mortar Bars - Mean Values
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
Expansion, %
0
20
40
60
80
Elapsed Time Since Casting, Days
+ Mean Exp.

Fig. 6.20


OR24-Limestone
Expansion of Mortar Bars – Mean Values
Expansion, %
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
–0.1
0
20
40
60
80
Elapsed Time Since Casting, Days
+ Mean Exp.

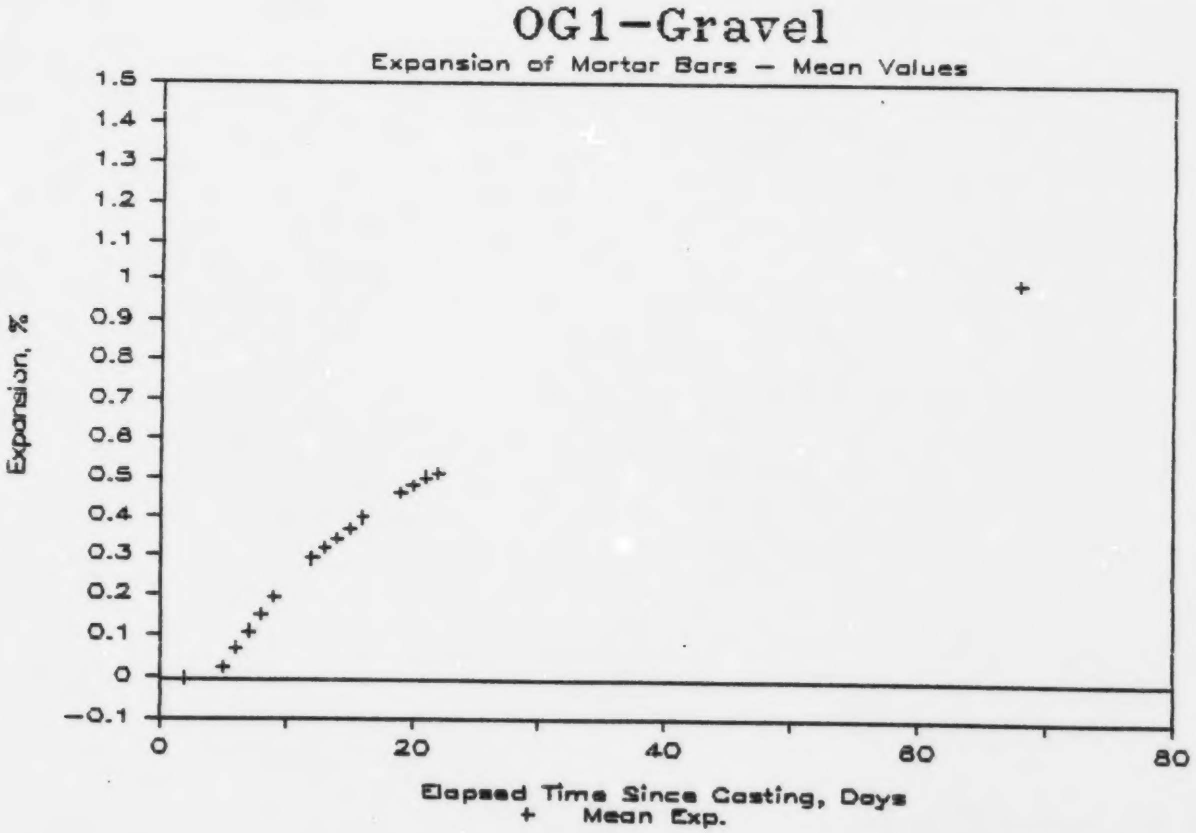
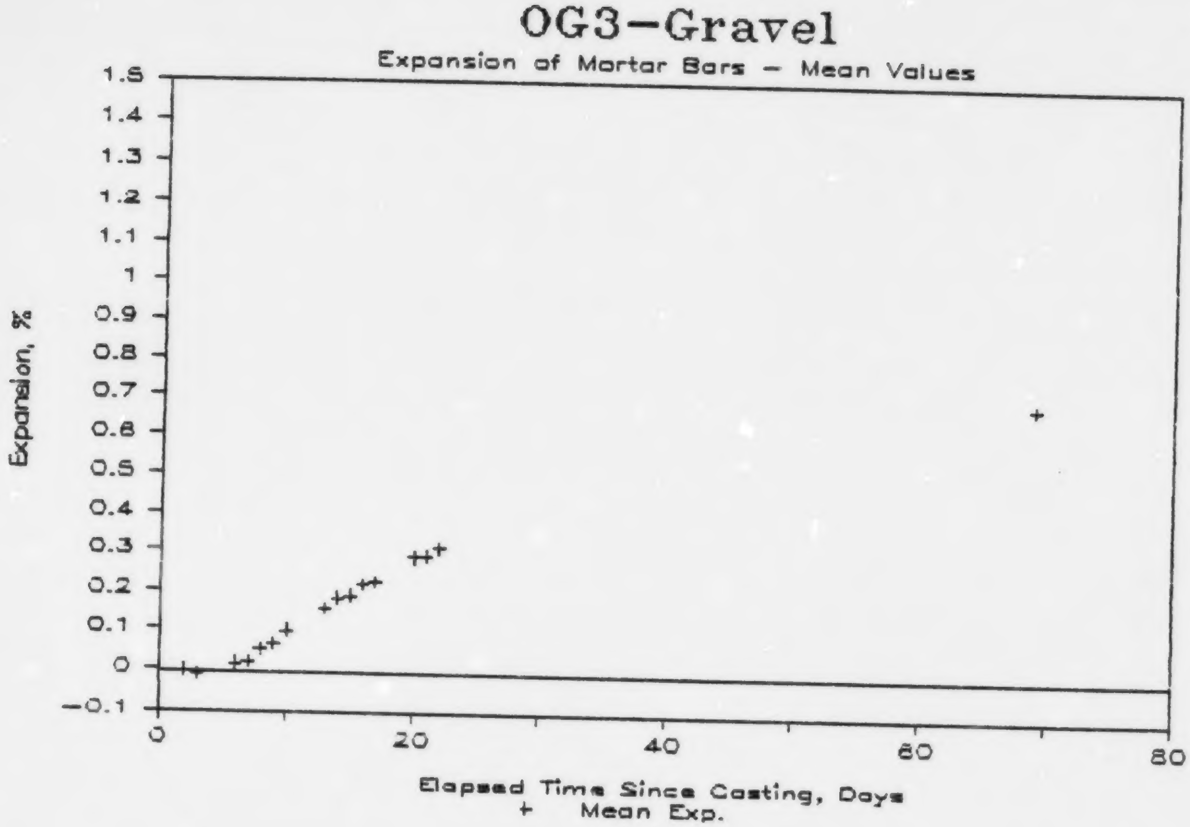
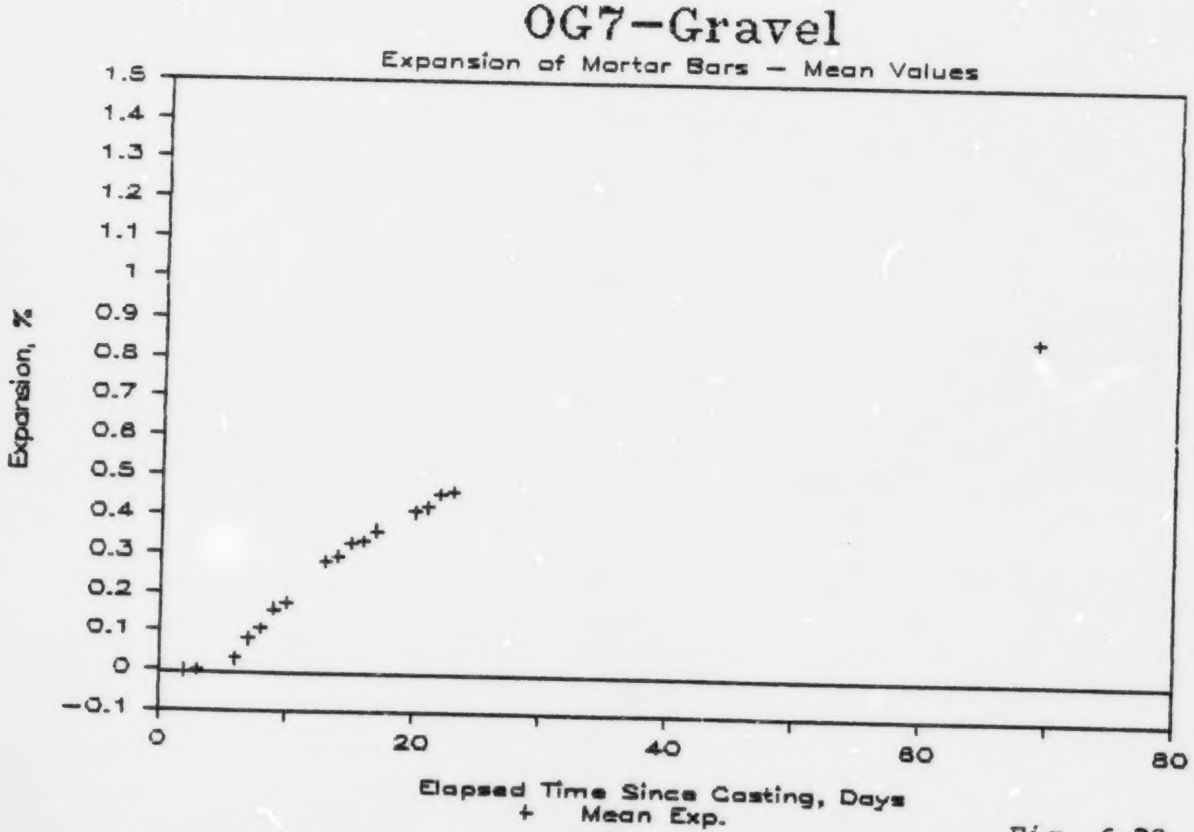

OG1-Gravel
Expansion of Mortar Bars – Mean Values
Expansion, %
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
–0.1
0
20
40
60
80
Elapsed Time Since Casting, Days
+ Mean Exp.

Fig. 6.21



OG3-Gravel

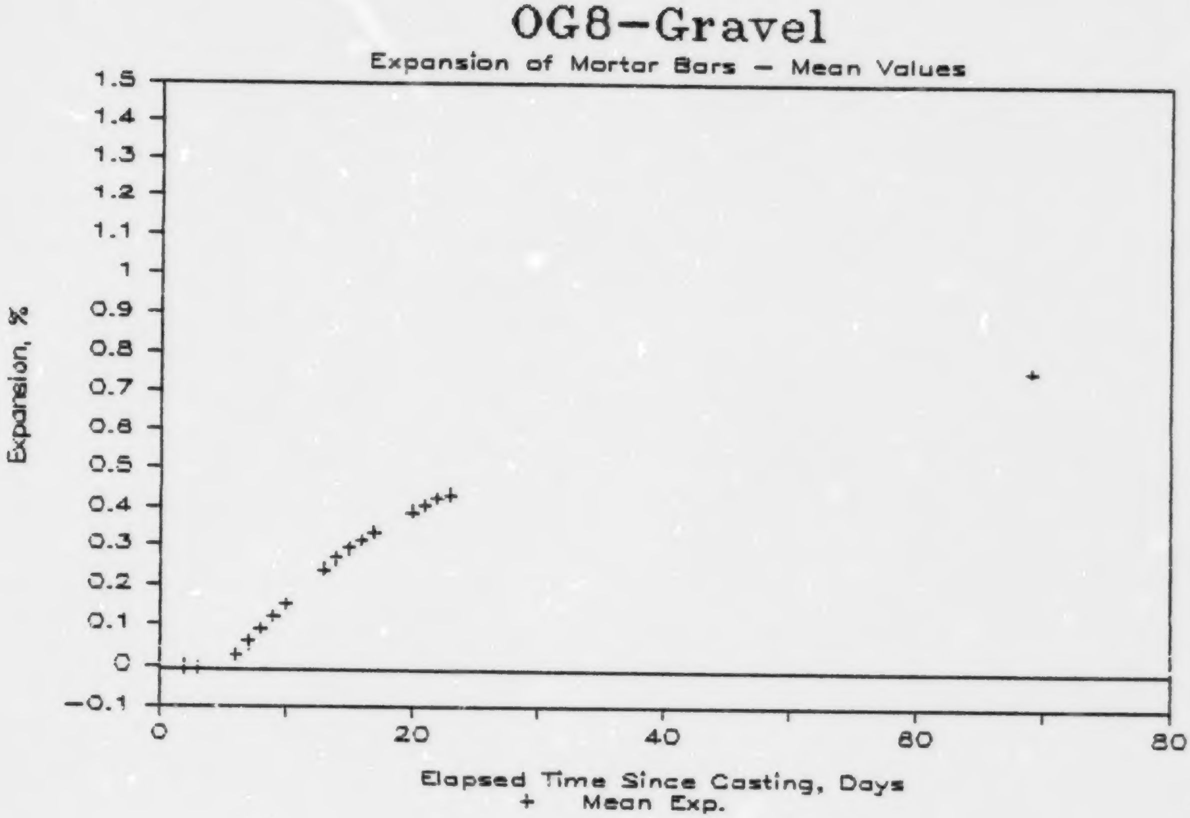
Expansion of Mortar Bars – Mean Values



OG7-Gravel

Expansion of Mortar Bars – Mean Values

Fig. 6.22



OG8-Gravel
Expansion of Mortar Bars - Mean Values
Expansion, %
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
0
20
40
60
80
Elapsed Time Since Casting, Days
+ Mean Exp.

Fig. 6.23

TABLE 6.11

SUMMARY OF ACCELERATED MORTAR BAR TEST RESULTS

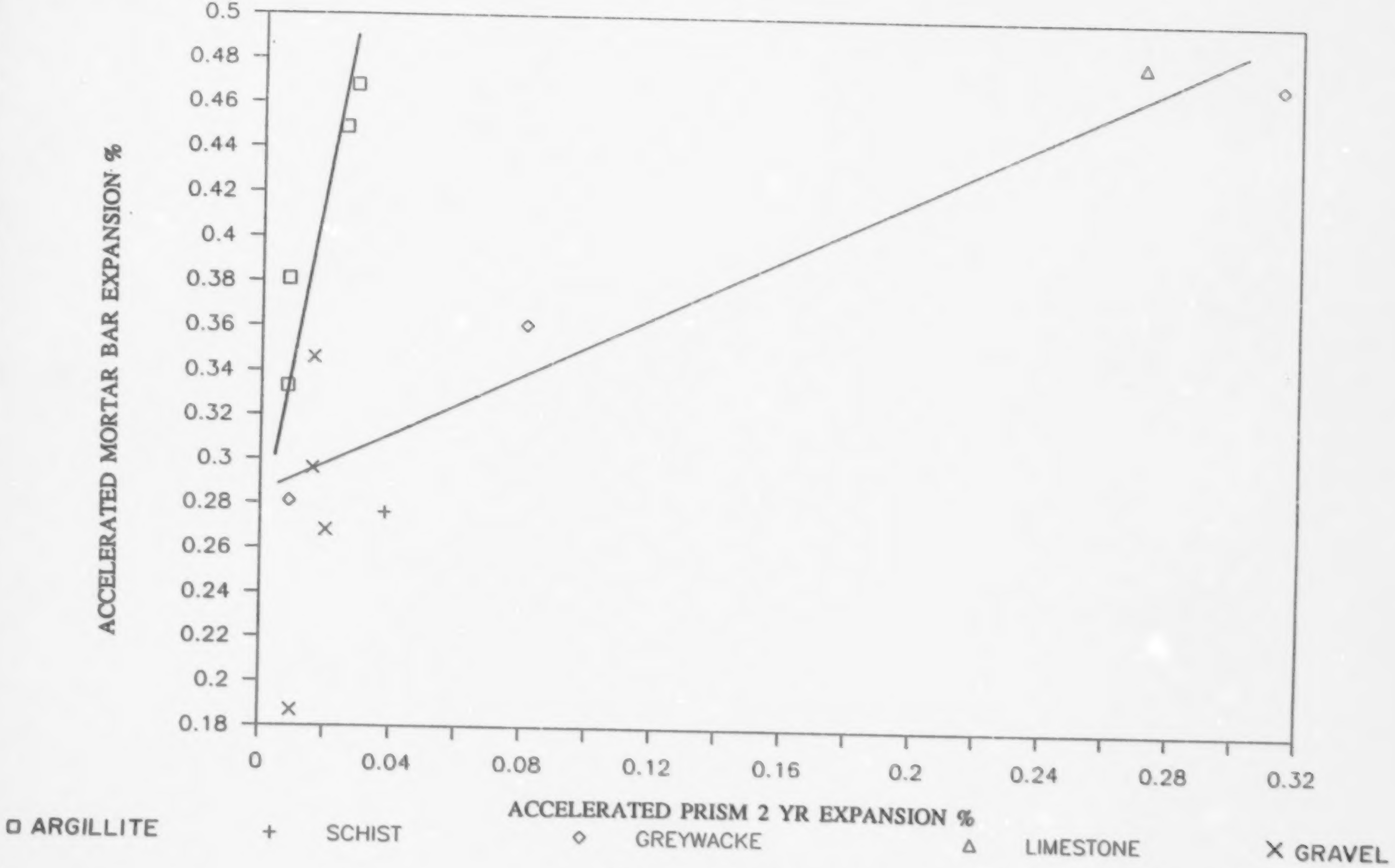
Spec No.	Rock Type	% Absorption	Accelerated Mortar Bar Test % Expansion 14 d	70 d	CSA Accel. Prism Test % Expansion 1 yr	2 yr	CSA Accel. Prism Test Expansion kg Alkali** 1 yr	2 yr	Constituents % Ch	M	Q	Potentially Deleterious Rock Types A	G	Qtz	Silic Volc	P	Total
R1	slate, meta argillite siltstone	0.65	0.468	1.123	0.017	0.028	0.021	0.023	25	60	13						
R2	slate, meta argillite mudstone	0.86	0.333	0.949	0.002	0.008	0.006	0.008	15	75	18						
R3	slate, meta argillite siltstone	0.43	0.381	0.991	0.006	0.008	0.007	0.008	13	30	50						
R4	slate, meta argillite siltstone	0.76	0.449	1.154	0.015	0.025	0.027	0.027	15	55	25						
R5	schist	0.41	0.276	0.751	0.019	0.038	0.026	0.032									
R7	meta greywacke	0.49	0.472	1.076	0.302	0.314	0.259	0.254	12	5	45						
R8	greywacke	0.47	0.361	0.946	0.071	0.081	0.085	0.081	20	3	50						
R9	greywacke	0.78	0.281	0.781	0.001	0.009	0.009	0.010	25	3	60						
R24	limestone	0.57	0.481	1.164	0.259	0.271	0.230	0.231	25	28	35						
G1	gravel	1.14	0.346	0.993	0.009	0.016	0.006	0.005				19	46	23	0	0	88
G3	gravel	1.39	0.187	0.686	0.005	0.010	0.007	0.009				30	15		0	0	45
G7	gravel	1.09	0.296	0.864	0.014	0.016	0.011	0.009				16	37	11		12	78
G8	gravel	0.59	0.268	0.756	0.015	0.020	0.009	0.008				19	25	0	39	0	79
CR1	Spratt Control				0.221	0.233	0.087	0.095									
CG2	Control Sudbury				0.014	0.022	0.010	0.016									
CR3	Nelson Control				0.011	0.019	0.001	0.002									

$$** \quad \frac{\%\ \text{exp. } 1.25\%\ \text{Alkali} - \%\ \text{exp. } 0.942\ \text{Alkali}}{3.875\ \text{kg} - 2.9\ \text{kg alkali/m}^3}$$

key Ch - chlorite
M - mica
Q - quartz
Qtz - quartzite
A - argillite
G - greywacke
P - phyllite

accelerated test, and expansive aggregates as determined in the CSA accelerated concrete prism test. However, despite the wide discrepancy in results between these two tests, some correlations can be made; for example:

> Fig. 6.24 shows 14-day accelerated mortar bar expansions plotted against two year CSA accelerated prism expansions for the same rock or gravel materials. As can be noted, for the basic rock types, there appear to be two distinct populations; one corresponding to argillitic rocks and one corresponding to the greywackes, limestone, schist and most of the gravels.
>
> The argillitic rocks appear to be much more responsive to the accelerated mortar bar test than to the CSA accelerated prism test. None of the argillitic samples have exceeded the CSA limits of 0.04% expansion at one year, whereas all the argillitic rocks had expansions exceeding 0.3% in the accelerated mortar bar test.
>
> The greywackes are more responsive to the CSA accelerated prism test than the argillites. Expansions in the accelerated mortar bar test are associated with significant expansions in the CSA prism test.
>
> The gravels tested generally exhibit considerable scatter in the data, tending to lie closer to the greywacke group in the lower range of expansion.
>
> A plot of Prism % expansion/kg Alkali, which is a measure of the sensitivity of the material to the alkali content of the mix, against 14-day expansion in the accelerated mortar bar tests, is very similar to Fig. 6.24, i.e., indicates different data populations for the greywackes and argillites.



Comparative Accelerated Mortar Bar and CSA Prism Test Results

Figure 6.24

For the rock types tested, the accelerated mortar bar 14-day expansion was compared to the percentages of major components, chlorite, mica and quartz. No good correlating occurs between the various components and expansion.

Similarly, for the gravels, the 14-day accelerated mortar bar expansion was compared to the various potentially deleterious components, argillite, greywacke, quartzite/quartz, silic-volcanics and phyllite. Poor correlations were found for argillite, quartzite, silic-volcanics and phyllites; however, there appears to be a reasonable correlation between percent greywacke and 14-day expansions and also between the total percentage of potentially deleterious rock types and 14-day expansions. These plots are illustrated in Fig. 6.25.

6.7 Discussion of Test Results

The test program has indicated conclusively that New Brunswick rocks of the argillitic-greywacke-schist types contain examples which range from nonreactive through moderately reactive to very reactive. One highly reactive siliceous limestone was also identified, but the reaction is invariably the slow alkali-silicate type.

All of the reactive rock types are identified most clearly by the CSA accelerated concrete prism test (A23.2-14A), which indicates a sensitivity to temperature.

Most of the rock types tested showed a slight sensitivity to concrete alkali levels; that is, they expanded more at increased alkali levels. The expansive rocks showed a very marked sensitivity to alkali content.

A number of aggregate materials met the current CSA limits of 0.04% expansion at one year but behaved in a manner very similar

Comparative Standard Mortar Bar Rates of Expansion and CSA Prism Expansions

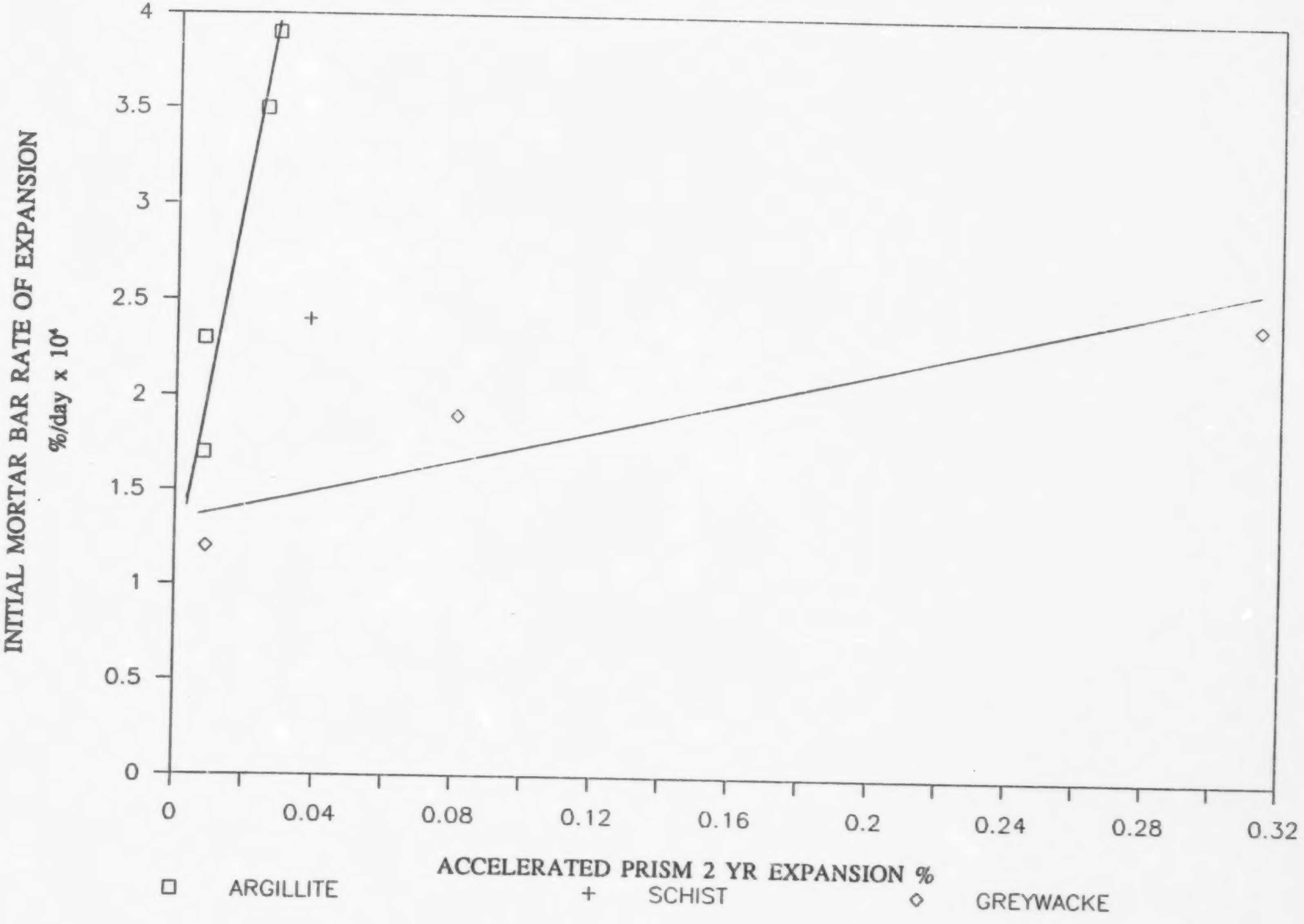


Figure 6.25

to the Sudbury control aggregates which is known to be an alkali-silicate reactive material. These materials included two argillites and two natural gravels (R1, R4, G7, G8). They all showed similar or greater expansion than the Sudbury control, as well as similar sensitivity to alkali content. Thus they should be considered deleteriously reactive.

One other point of interest is that all the argillitic-greywacke-schist rocks are continuing to expand at two years, even those in which expansions have been relatively minor. This is also true of the reactive limestone and one possible marginal limestone. This behaviour is in contrast to that of all the other rock types tested where expansion has apparently ceased after about 1.5 years.

The test and control aggregates responded relatively poorly in the standard mortar bar test (ASTM C277). This may be due in part to the revised container standards issued in 1987. As discussed previously, it was reasoned that if the problem is leaching of alkalis from the mortar bars over time, the behavior of the test material might be predicted from the rate of expansion during the early part of the test. This rate does appear to correlate with data from both the prism test and the accelerated mortar bar test as shown in Figs. 6-25 and 6-26. Fig. 6.25 illustrates the initial standard mortar bar rate of expansion plotted against prism expansion at two years. The data are very similar in format to Fig. 6.24, providing more evidence that the argillites and greywackes may respond in a different manner to the two tests.

Fig. 6.26 illustrates a plot of accelerated mortar bar expansions against the initial rate of expansion of the standard mortar bar. Again, the greywackes and argillites appear to represent two separate populations of data.

Comparative Accelerated Mortar Bar Expansions and Standard Mortar Bar Rates of Expansion

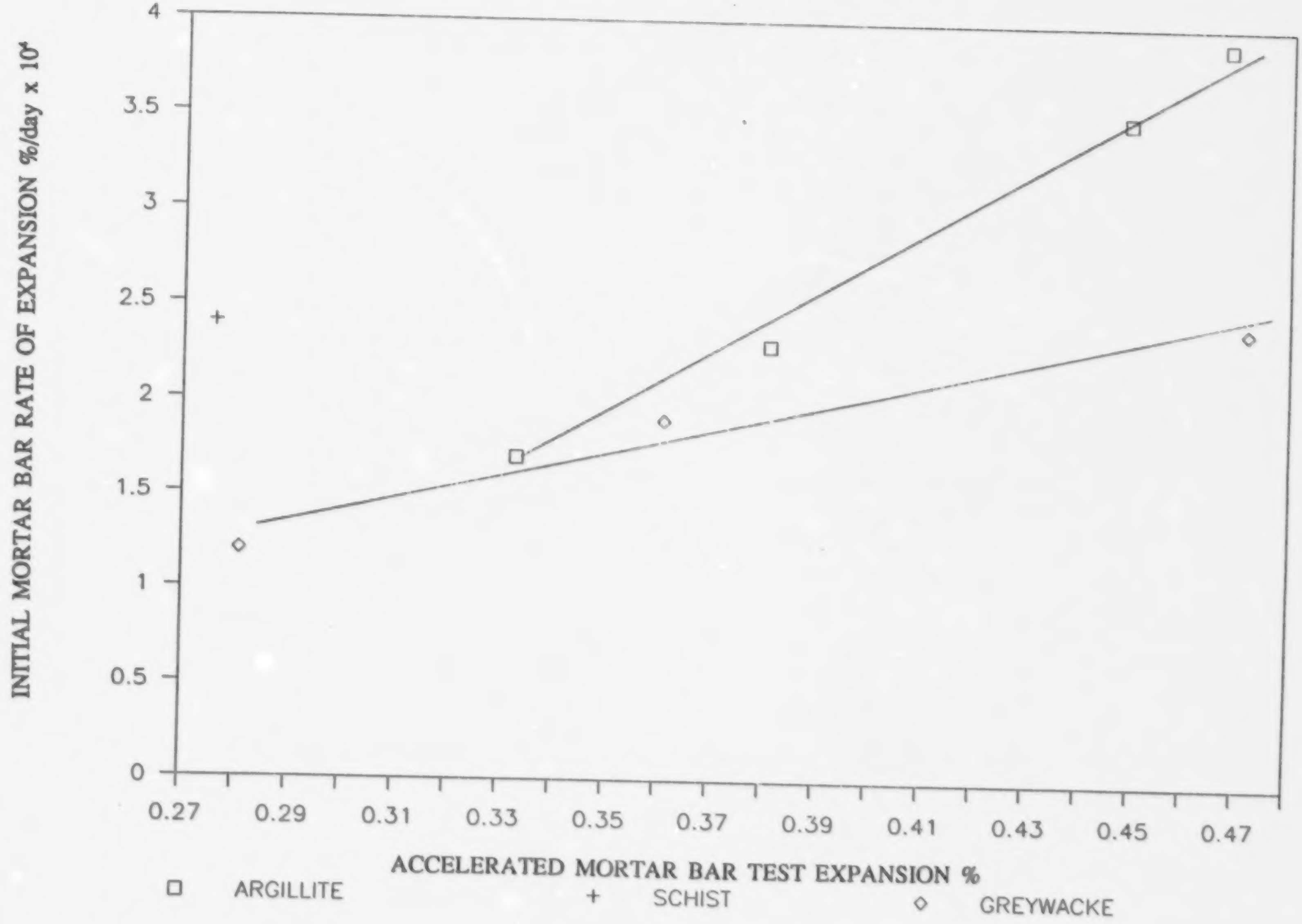


Figure 6.26

It would appear that the greywacke type rocks respond more to conditions attained in the prism test whereas the argillites are more responsive to conditions in the mortar bar type of tests.

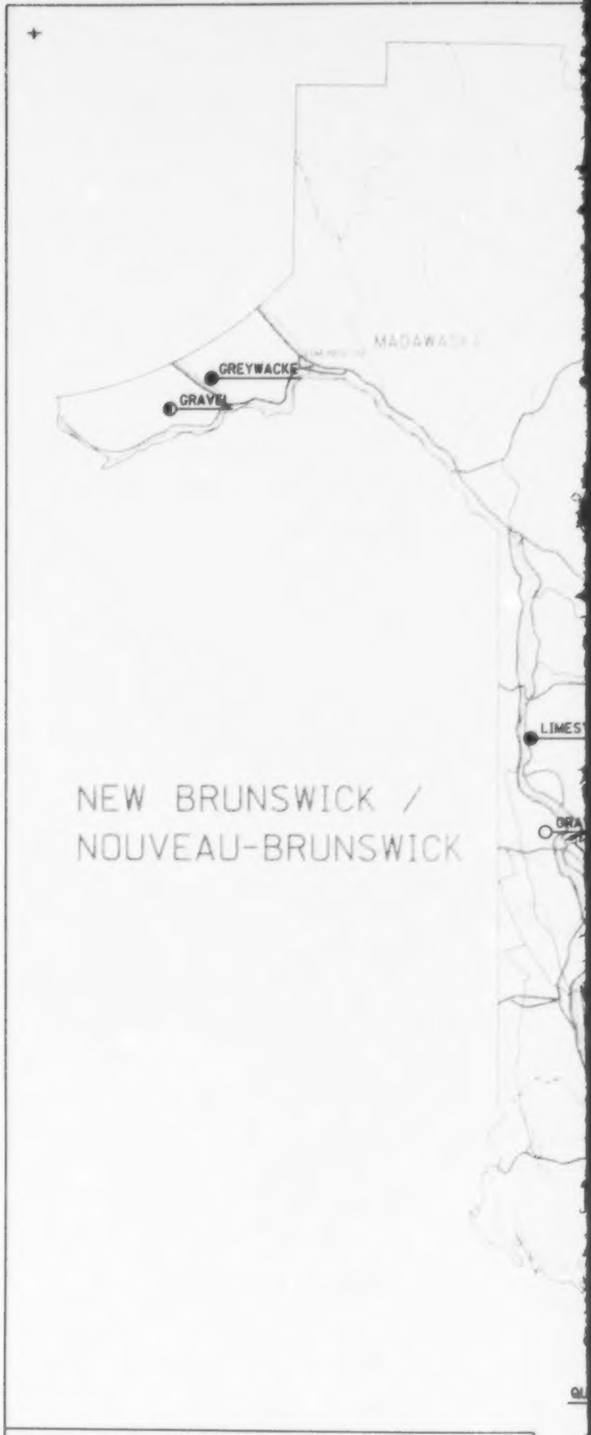
In general, there is also a poor correlation between the Accelerated Mortar Bar Test results and the CSA Accelerated Prism Test results. The accelerated mortar bar tests indicate that the materials tested are generally much more expansive than would be expected from the prism test results. These results may actually be a measure of the potential for expansion given an unlimited supply of alkali, since it is known from the prism tests that most of these aggregate materials show increased expansions with increasing mix alkali contents. As was shown on Fig. 6.24, there does appear to be a relationship between results of the two tests; however, as noted, the greywackes and argillites respond differently to the two tests.

Petrographic analysis of concrete prisms after two years testing has indicated that there are four main consequences of reaction: formation of alkali silica gels; formation of crystalline alkali silicates; formation of reaction rims on reactive particles; and fracturing of aggregates and paste. Considerable internal fracturing was found to occur in specimens of argillitic rocks in which expansions were less than 25 percent of current limits.

It has not been possible to distinguish petrographic characteristics which would differentiate between reactive and non-reactive aggregates of the same rock type, i.e., argillites, greywackes and schists, altough the reactivity is believed to be related to the matrix size quartz and phyllosilicates content.

The components of the natural gravels which showed evidence of reaction were argillites and greywackes similar to the test specimens which proved deleterious.

Fig. 6.27 illustrates the location of all samples tested in the prism test which are considered to be reactive or marginal together with those considered innocuous. It is interesting to note that the deleterious types appear to be confined to the western and southern portions of the Province. Reference to Fig. 4.10, which indicated the percentages of structures showing severe evidence of reaction on a regional basis, it can be seen that there is a similar trend; that is, higher percentages of severe reaction in the south represented by the Saint John-St. Stephen-Sussex areas and the northwest represented by the Upper Saint John River-Campbellton area. To the north and east - Fredericton to Bathurst area, the percentage is less.


MADAWASKA
GREYWACKE
GRAVEL
LIMEST
BRA
NEW BRUNSWICK /
NOUVEAU-BRUNSWICK
QU

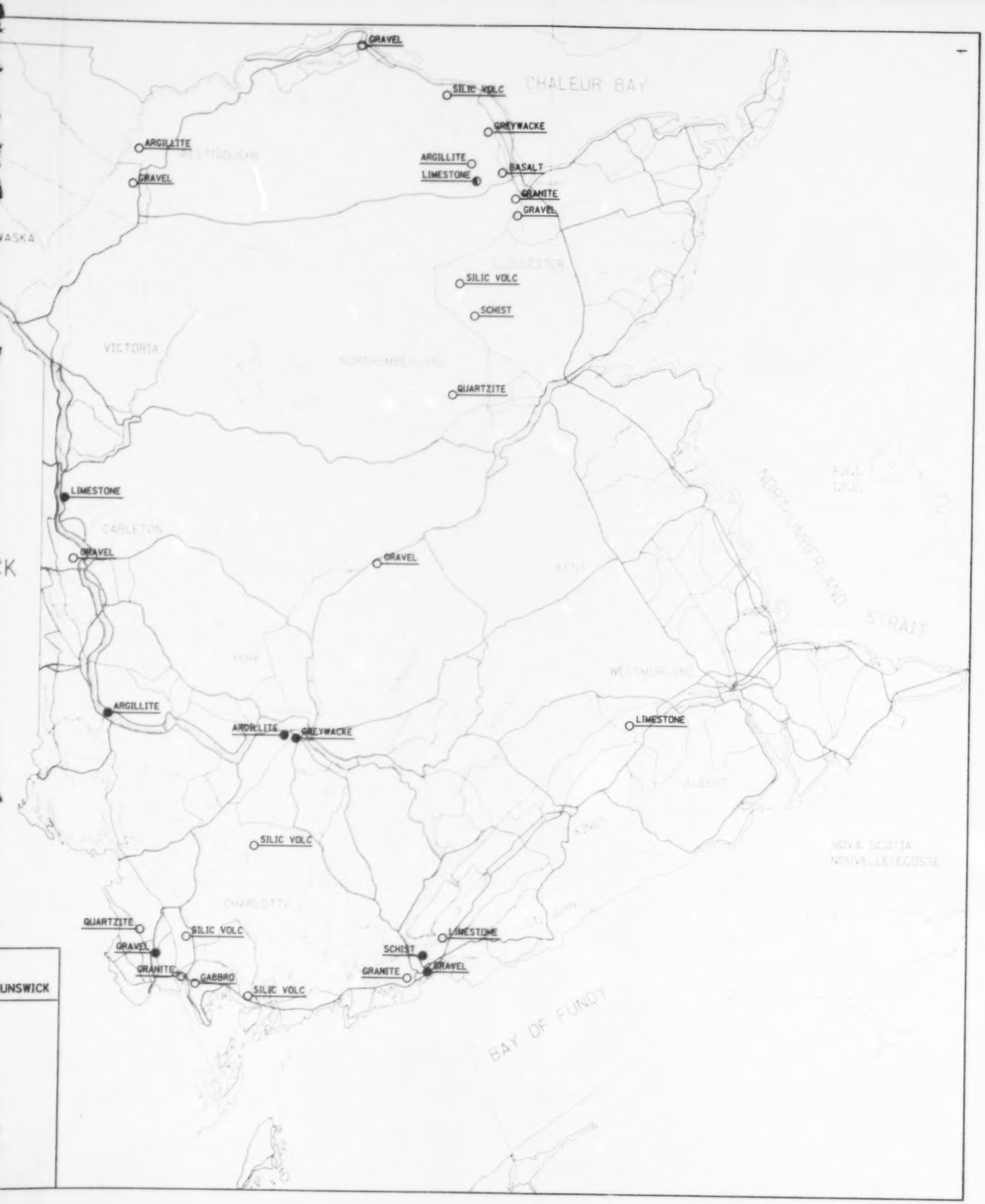
STUDY OF THE ALKALI REACTIVITY

POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

FIGURE 6.27 GEOGRAPHIC DISTRIBUTION
REACTIVE & NON REACTIVE ROCKS
BASED ON CSA A32.2-14A
ACCELERATED PRISM TEST

LEGEND
● REACTIVE
○ NON REACTIVE
◐ MARGINALLY REACTIVE

1284-30 / P-100


GRAVEL
CHALEUR BAY
SILIC VOLC
GREYWACKE
ARGILLITE
RESTIGOUCHE
GRAVEL
ARGILLITE
LIMESTONE
BASALT
GRANITE
GRAVEL
WASKA
GLOUCESTER
SILIC VOLC
SCHIST
VICTORIA
NORTHUMBERLAND
QUARTZITE
LIMESTONE
CARLETON
GRAVEL
GRAVEL
CK
KENT
NORTHUMBERLAND STRAIT
P.E.I.
Î.P.É.
YORK
WESTMORLAND
ARGILLITE
ARGILLITE
GREYWACKE
LIMESTONE
ALBERT
KINGS
SILIC VOLC
NOVA SCOTIA
NOUVELLE-ECOSSE
CHARLOTTE
SAINT JOHN
QUARTZITE
SILIC VOLC
GRAVEL
LIMESTONE
SCHIST
GRANITE
GABBRO
GRANITE
GRAVEL
UNSWICK
SILIC VOLC
BAY OF FUNDY

7.0 CONCLUSIONS

New Brunswick is located within the Appalachian region of Canada and both the physiographic and major geologic zones parallel the northeast and southwest Appalachian trend.

To the north and west of the Province, the rocks consist mainly of folded sediments of Devonian, Silurian and Ordovician age. The Miramichi belt lying south of these sediments consists of Ordovician sediments and volcanics intruded by Devonian granites. To the south and east is an extensive triangular trough of Carboniferous sediments, which are generally too soft for use as aggregates. To the west of this trough are Silurian greywackes and sediments intruded by Devonian granites. South of the trough are older sediments and volcanics.

A review of the surficial geology of New Brunswick indicates that the petrography of sand and gravel deposits is closely related to the bedrock type in the vicinity of the deposit.

Thirty-two current and past sources of concrete aggregate were sampled and examined petrographically during the study. A close correlation of the components of natural gravels with nearby bedrock types was confirmed. The four most prominent rock types present in the gravels, in order of importance were: granites, argillites, limestones and greywackes. Phyllites, schists, quartzites and silicified volcanics occurred in much lesser amounts, and basic igneous rocks were generally found in only minor amounts. Large percentages of the gravels (typically 40-100 percent) were composed of rock types which would normally be considered deleterious from the point of view of alkali reactivity. The major rocks of these types were the argillites and greywackes. They predominate in the northwest and south of the province, where they account for 50-90 percent of the total aggregate composition.

The petrographic analysis has indicated that the potentially deleterious rock types found in New Brunswick gravels currently used for concrete aggregates are those which are associated with the slow, late expanding type of reaction (CSA Group 2 rocks, Table 3.1).

The field condition of 282 structures throughout the Province was assessed from the point of view of alkali-aggregate reactivity. One hundred and eighty-three of these structures were visited and the remainder assessed from the work of others (6,8). The structures examined were primarily highway and railway bridges, with a few dams and retaining walls, etc. All would be considered Class A, B and C exposures. In general, about 35 percent of the structures built between 1955-1975 were considered, on the basis of visual evidence, to show some evidence of alkali-aggregate reaction. In the pre 1955 structures, about 70% were judged to show some evidence of reaction.

Based on this review, it appears that evidence of reactivity may require 8-10 years to manifest itself and upwards of 20 to 30 years to become severe.

There appears to be a definite correlation between severe reactivity damage and geographic location. The highest percentage of structures showing severe damage is in the southern and northwestern parts of the Province.

Fifty-four of the structures examined were selected to obtain concrete samples for detailed petrographic studies and to document, aggregate sources, where possible. At least seven structures in southern New Brunswick showing evidence of reactivity were built with aggregates from the Saint John area. Three structures showing evidence of reaction were built with quarried Silurian greywackes from sources near Fredericton. At least two cases of severe reaction appear related to aggregates from the banks of the St. John River near Woodstock and Perth Andover.

Detailed petrographic analysis of samples from ten of these structures has indicated that alkali-aggregate reaction was a major cause of concrete deterioration in the structures studied.

Greywacke was the type of aggregate most often associated with the deterioration. It was the most abundant rock type in eight of the ten structures studied. Other rock types which showed evidence of reaction, in order of importance, were argillites, phyllites, chert and some granites.

Greywackes, argillites and phyllites are associated rock types differing in the amount of induration and content of argillaceous material (clay minerals). Greywackes and argillitic rocks are often associated in outcrop in New Brunswick. Cherts are not common in the New Brunswick concrete aggregates currently being used.

The aggregate testing program has confirmed that greywackes found in New Brunswick range from non-reactive through moderately reactive to very highly reactive. Some argillites and schists would also classify as reactive, based on comparison with a known alkali-silicate control sample. Except for one highly reactive impure calcitic limestone, all reactions appear to be the slow, late-expanding silicate type.

Of the eight natural gravels tested, two could be classified as reactive based on comparison with a known alkali silicate reactive control rock. None of the gravels or argillites tested exceeded the current CSA expansion limits of 0.04% at one year.

An analysis of expansion obtained in tests on natural gravels indicated that greywacke was probably the most dominant reactive rock type.

The geographic locations of test samples that were found to be reactive or marginally so closely match to the distribution of severe reaction in field structures, i.e., the southern and north-western portions of the Province. As noted previously, these are the same areas where greywackes and argillites are most prevalent in the parent bedrock and in the natural gravel deposits.

Petrographic analysis of test prism specimens has shown that test prism expansion is closely related to silica gel formation, cracking of aggregates and paste, formation of crystalline silicates, and reaction rims. In the natural gravel samples, there was similar evidence that certain particles of greywacke and argillite were reactive.

Unfortunately, it was not possible to distinguish, petrographically, reactive aggregates from non-reactive ones within the same suite of rocks. There is evidence, however, that reactions are associated with the content of very fine matrix size quartz and phyllosilicates.

The other rock types tested including quartzites, silicic volcanics, granites, gabbros, and pure limestones would be classified as non-reactive, although most of them showed increased expansion with increased alkali content of the mixture.

There is clear evidence from the test program results that the reactive New Brunswick aggregates are sensitive to temperature conditions, since most of the reactions only occurred at the 38°C test temperature. They are also sensitive, in varying degrees to the alkali content of the concrete.

The lack of agreement between various types of test raises a number of practical concerns.

The use of the standard mortar bar test ASTM C227 is not recommended to evaluate the reactivity of the types of rock materials studied in this test program, i.e., slow expanding silicate types. There is also growing evidence that the test containers specified in 1987 are influencing the test results in some manner.

The current accelerated CSA concrete prism test (38°C) positively identifed some reactive materials during this test program. However, some modifications of the cement content or the expansion limits, or both, may be required to ensure positive identification of all potentially reactive New Brunswick rocks.

The observations that suggest this are:

- Petrographic studies of field concretes indicated that of nine structures containing natural gravel aggregates, eight showed evidence of reaction. It was expected that some of the eight gravels tested during this program would classify as reactive; however, all specimens passed the current CSA limits for expansion (0.04% at one year).

- The alkali silicate reactive control sample which simulated the behavior of the petrographically similar New Brunswick rocks, as expected, also passed current CSA test requirements. The results obtained on this control were very similar to those obtained by other laboratories, indicating that test procedures were correct.

- All the greywackes, argillites and schists were sensitive to the alkali content of the mixture and all specimens continue to expand at two years.

- The total alkali content of concrete specified by CSA for the accelerated prism test, calculated for 310 kg/m^3 cement containing 1.25% Na_2O is 3.875 kg of Na_2O equivalent per cubic metre of concrete. The alkali content of cement in New Brunswick is around one percent. Field concretes, especially for severe exposures are routinely made with cement contents of 410-420 kg/m^3. Thus, the alkali content of field concretes may actually be in excess of that specified for the CSA accelerated prism test, raising some concern that the field concrete would deteriorate more than the test results would indicate.

- Certain argillites which had less than 25 percent of the current allowable expansion, yet according to petrographic evidence suffered substantial internal damage during the prism tests. Such performance raises concern that the test may not always give unquestionable results.

- The behavior of the specimens in the accelerated (80°C) mortar bar test indicates that many New Brunswick aggregates have the potential for deleterious expansion, given an abundant supply of alkali. Many of these aggregates would meet the current CSA specification requirements, which suggests that the accelerated mortar bar test may be too severe, however, many of the New Brunswick rocks and gravels tested do have extremely high expansion values and similar rock types appear unstable in field concretes.

Thus, there is a body of evidence based on field performance, the behaviour of the alkali-silicate control sample, the performance of the suspect rock types (sensitivity to alkali content and continued slow expansion), substantial internal fracturing even at low expansion levels, and marked expansion in the accelerated mortar bar test, that the current test limits may not always positively identify reactive New Brunswick aggregates, especially those which may be prone to very slow, long-term expansion.

No natural sands were indicated as reactive from the mortar bar tests. There is reason to believe that some of these sand materials could be reactive, however, since they are petrographically similar to the natural gravels. Thus, a concrete made completely with natural gravel and sand could be more expansive than those tested with a non-reactive control sand. This could explain, to some extent, the discrepancy between field evidence of alkali aggregate damage to structures made with natural gravel aggregates and the performance of these materials under test.

Gravels with more than 15 percent greywacke or with a substantial percentage of argillite should be suspected of being deleteriously reactive.

At the present state of knowledge, all suspect aggregates should be tested using the CSA accelerated prism test, preferably at two alkali levels to assess sensitivity, and the results compared with the performance of a known reactive control of similar petrography such as the Sudbury gravel. Acceptance of materials must be based on an engineering assessment of the results, together with an evaluation of the environmental conditions to which the concrete will be exposed.

8.0 RECOMMENDATIONS

.1 More fundamental research into the mechanisms of alkali aggregate reactions, together with establishment and modification of test procedures to evaluate reactive materials must be carried out; however, such work may have to be of a very long term nature.

2. Further petrographic studies on concrete samples from field structures obtained during this study should be carried out. In particular, the percentages of various rock types in the concrete should be determined, together with the types and percentages of reactive particles. Determination of the alkali content may also be of value. This information would permit further evaluation of reactive rock types together with an indication of the amounts of such types necessary to cause deleterious reactions.

3. Further petrographic examination of accelerated mortar bar specimens should be undertaken to determine reaction products and to determine, if possible, why some materials react so dramatically to this test but are unresponsive in the prism test.

4. Because of the extensive distribution of potentially deleterious greywackes and argillites in the Province, studies into mitigative measures such as use of fly ash, silica fume, slags and low alkali cements to control deleterious reactions would appear warranted.

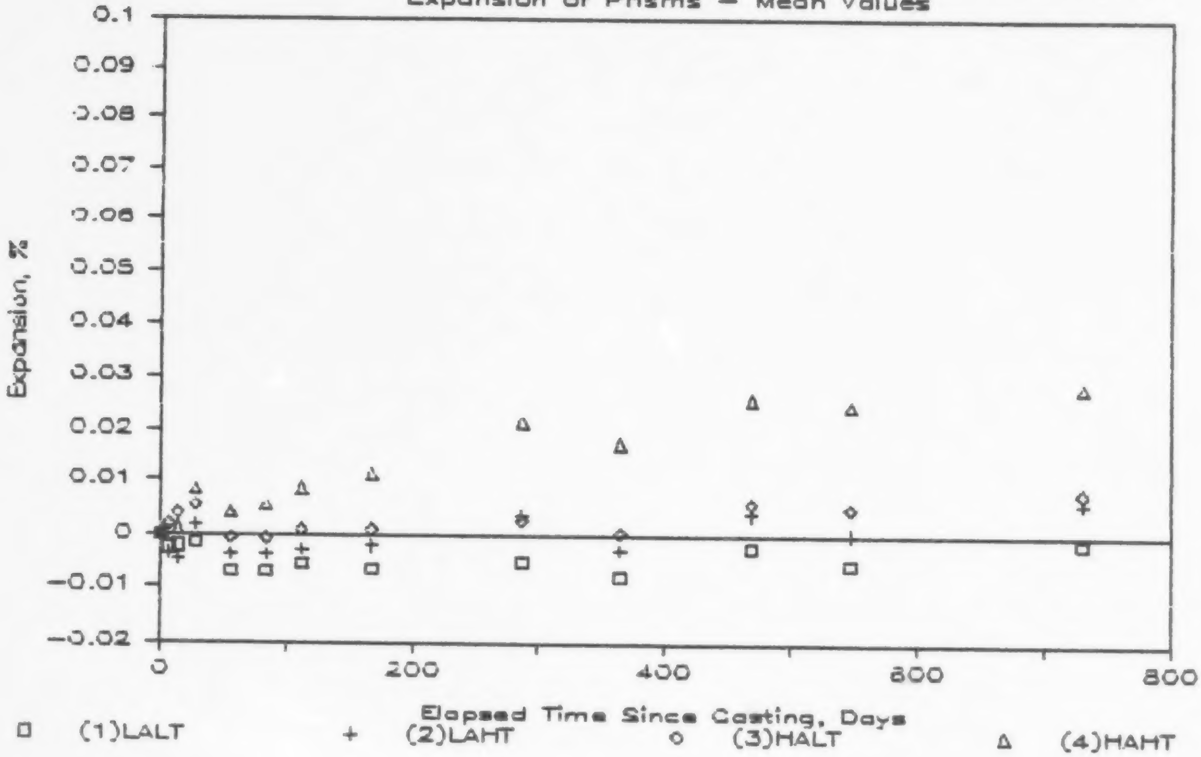
APPENDIX 1

EXPANSION VS TIME PLOTS

Prism Tests	19 pages
Mortar Bar Tests	19 pages

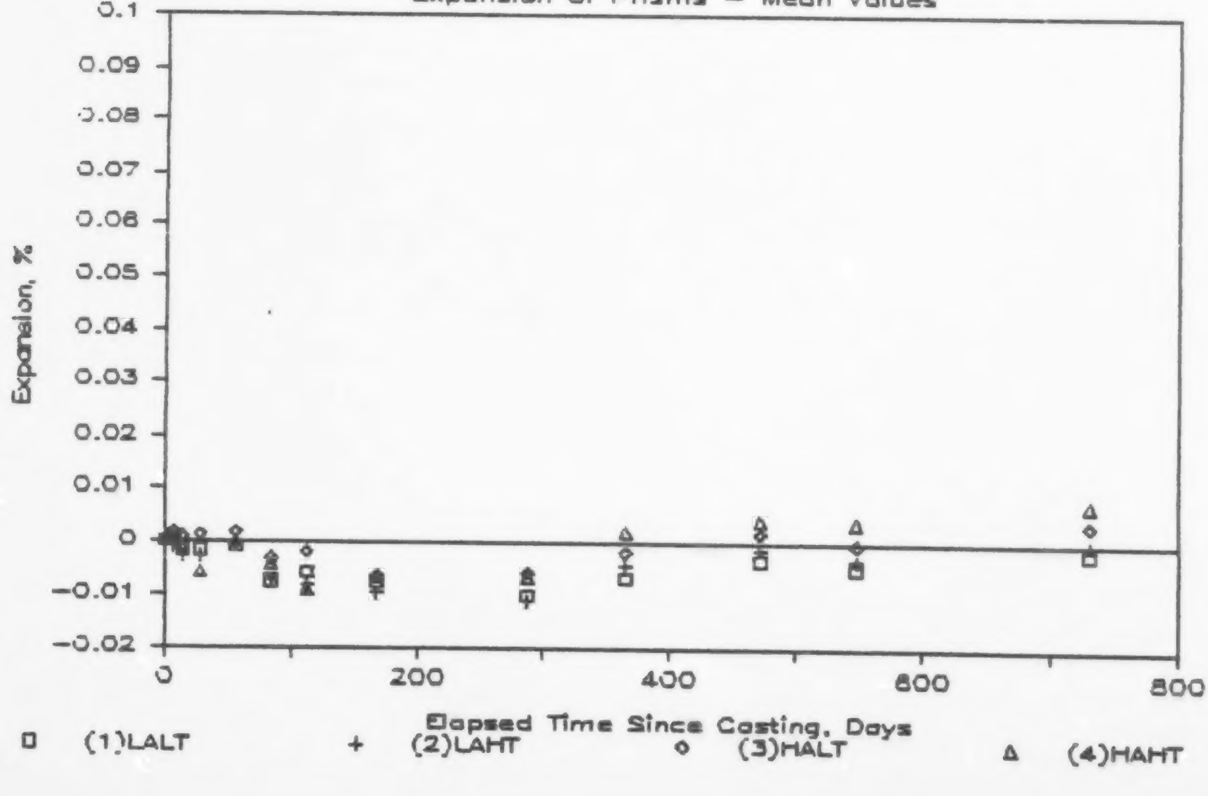
R1-Slate, Meta-argillite (Siltstone)

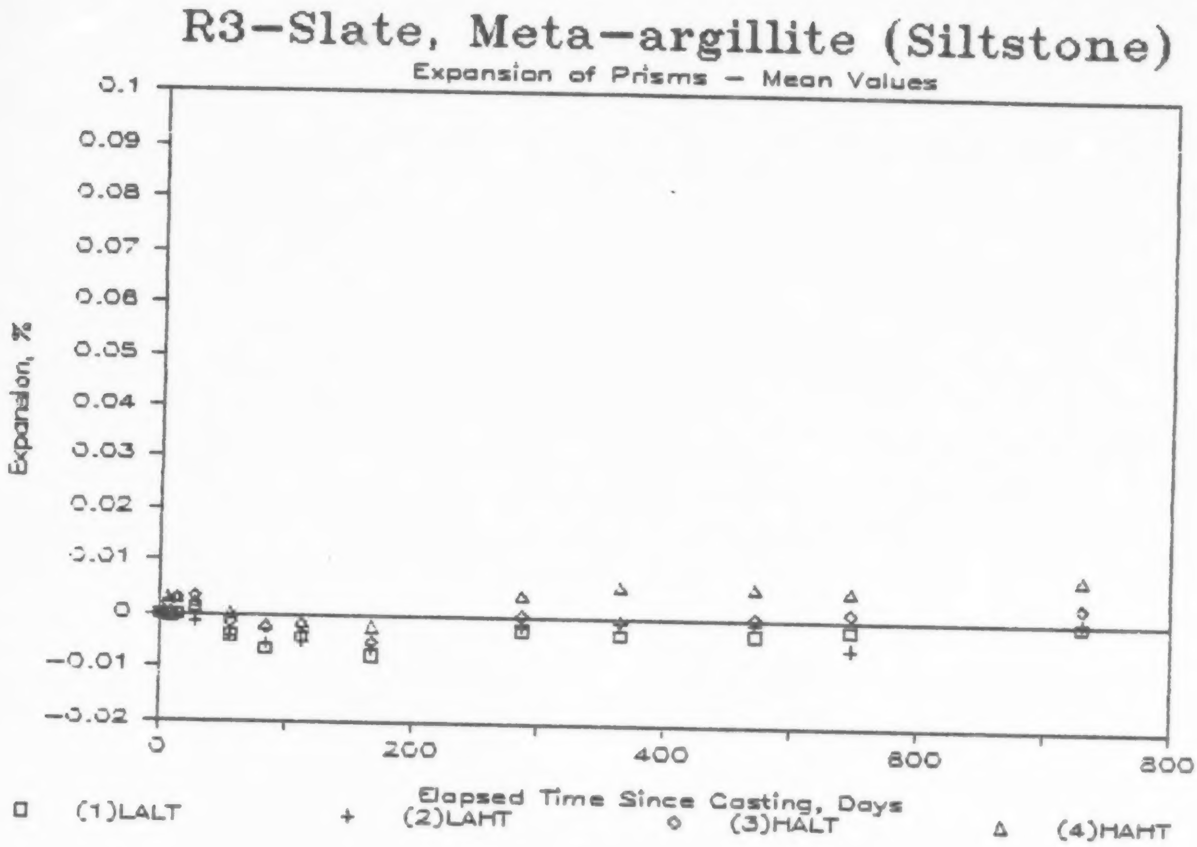
Expansion of Prisms - Mean Values



R2-Slate, Meta-argillite (Mudstone)

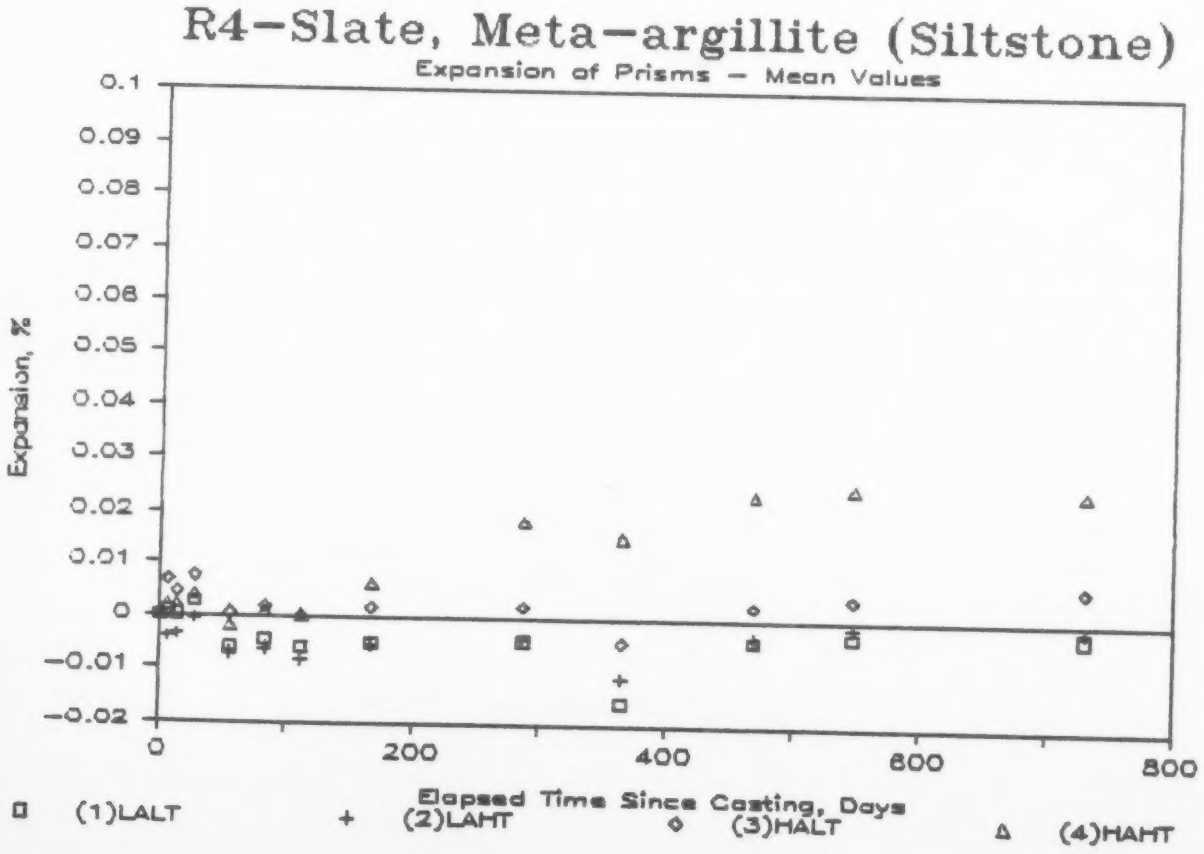
Expansion of Prisms - Mean Values





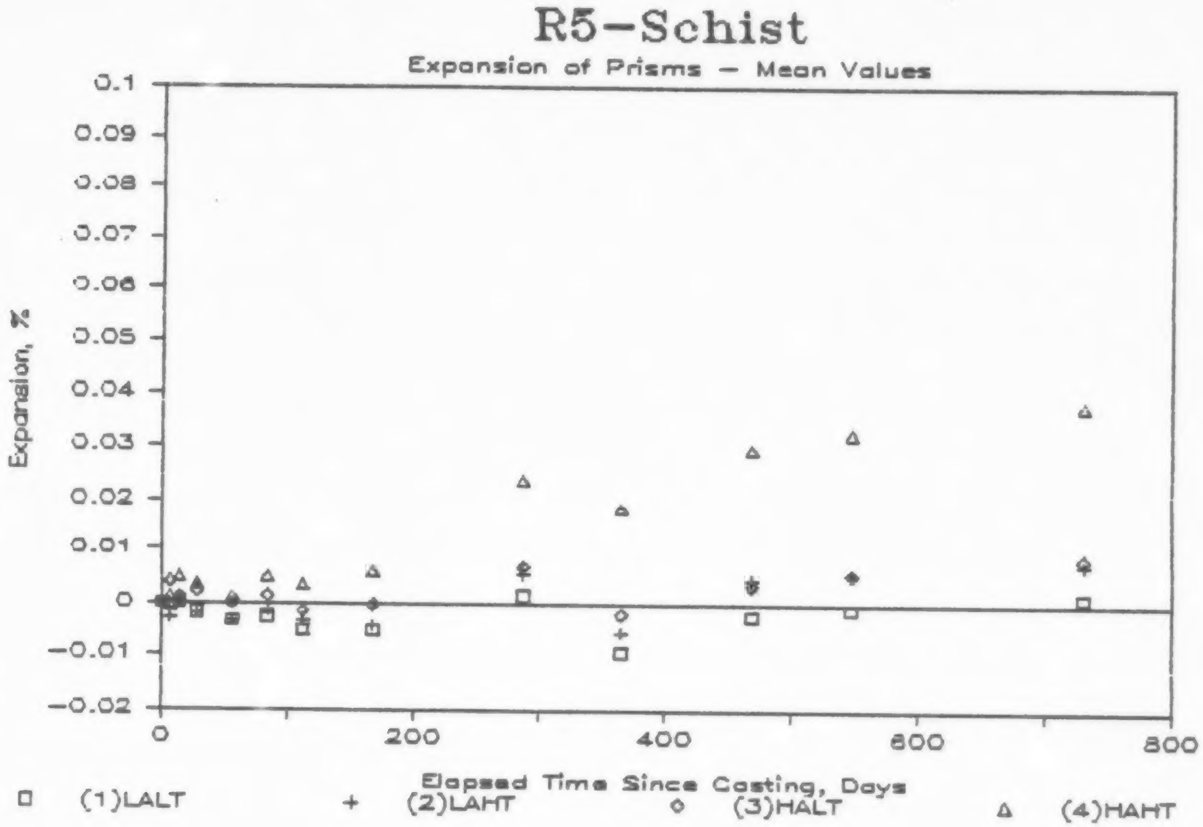
R3-Slate, Meta-argillite (Siltstone)

Expansion of Prisms - Mean Values



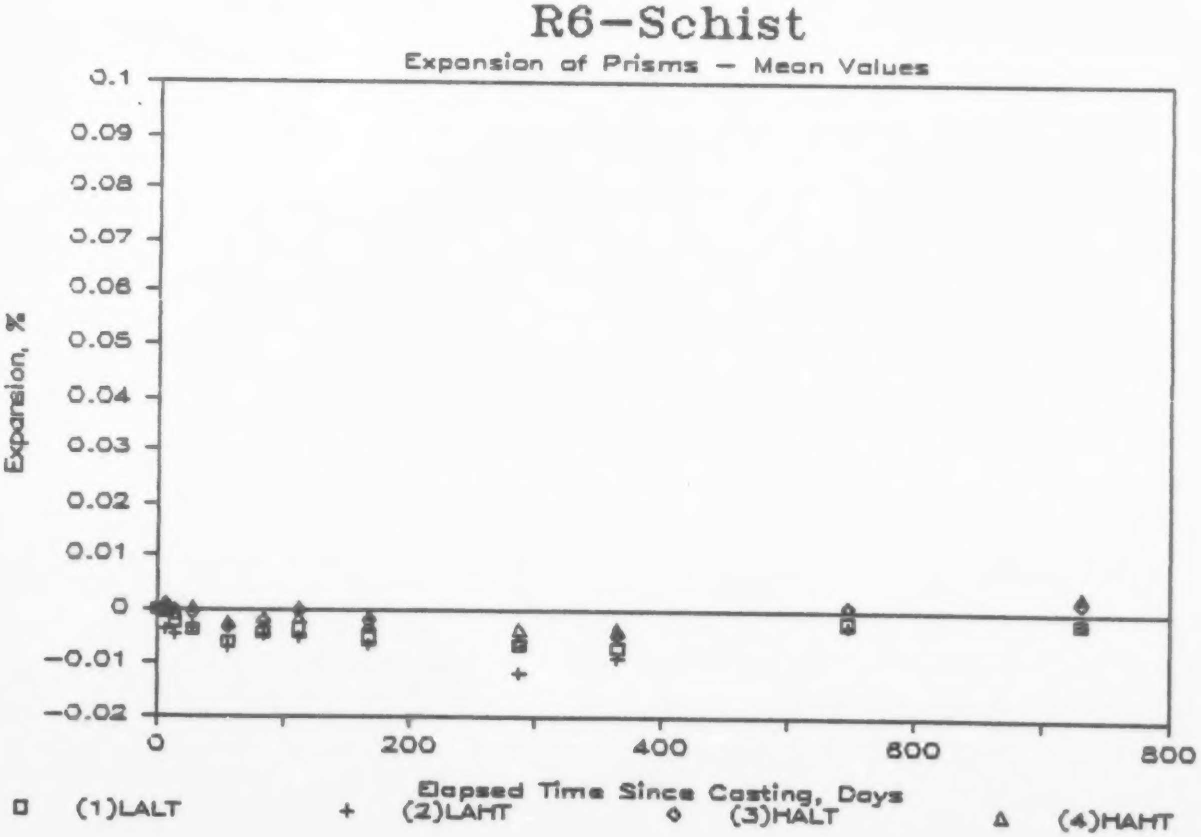
R4-Slate, Meta-argillite (Siltstone)

Expansion of Prisms - Mean Values



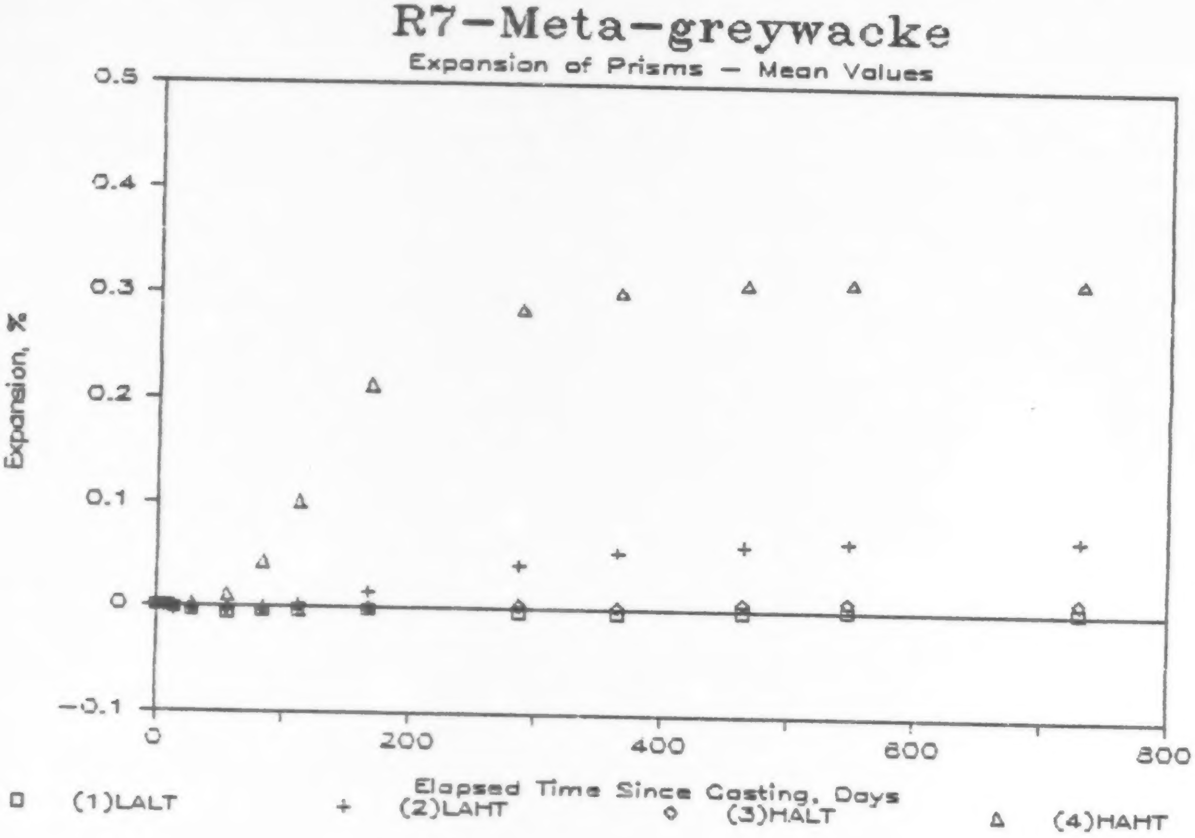
R5–Schist

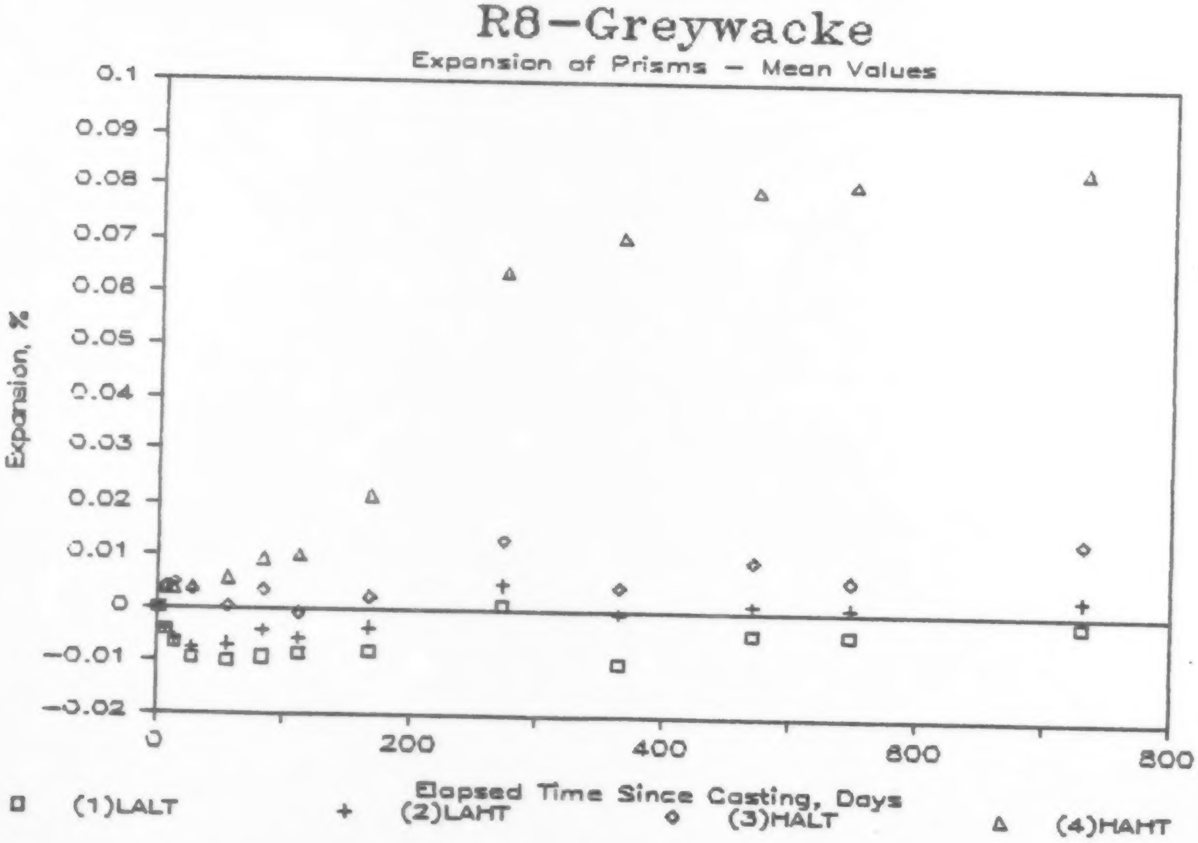
Expansion of Prisms — Mean Values

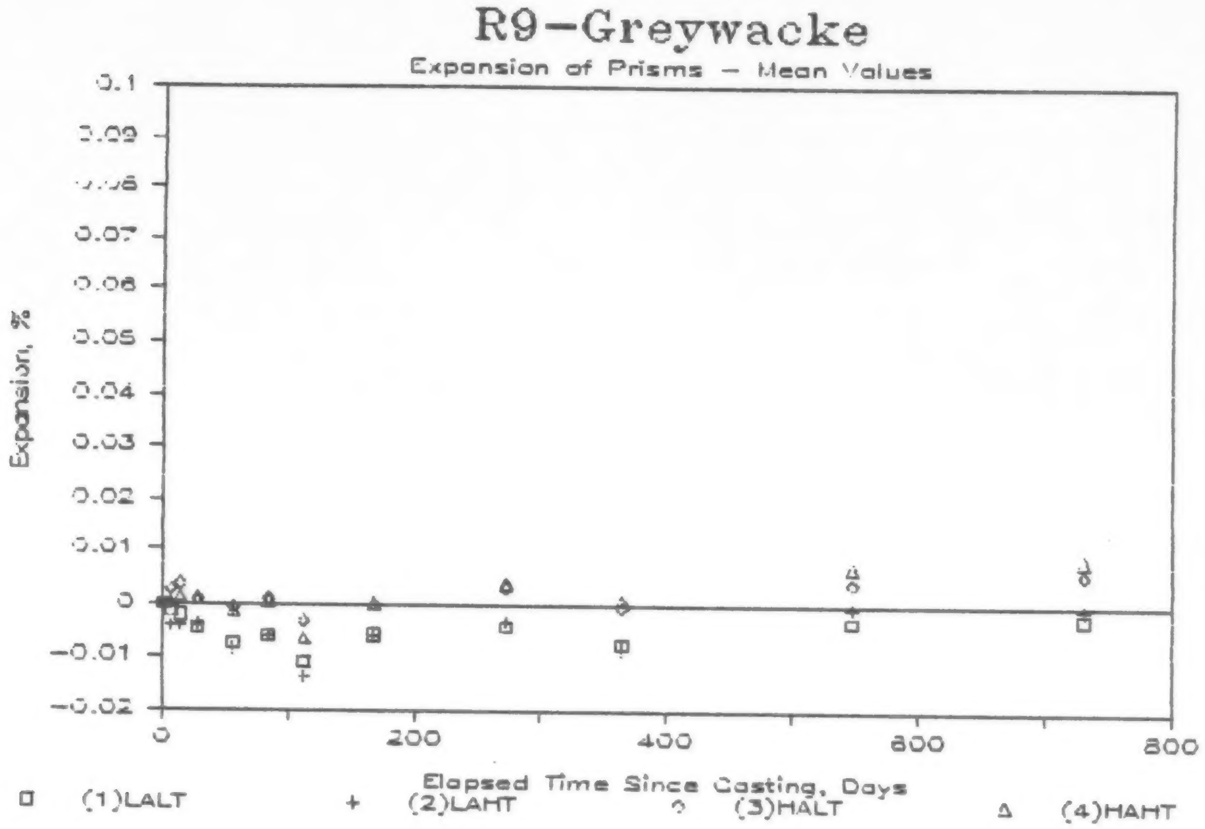


R6–Schist

Expansion of Prisms — Mean Values

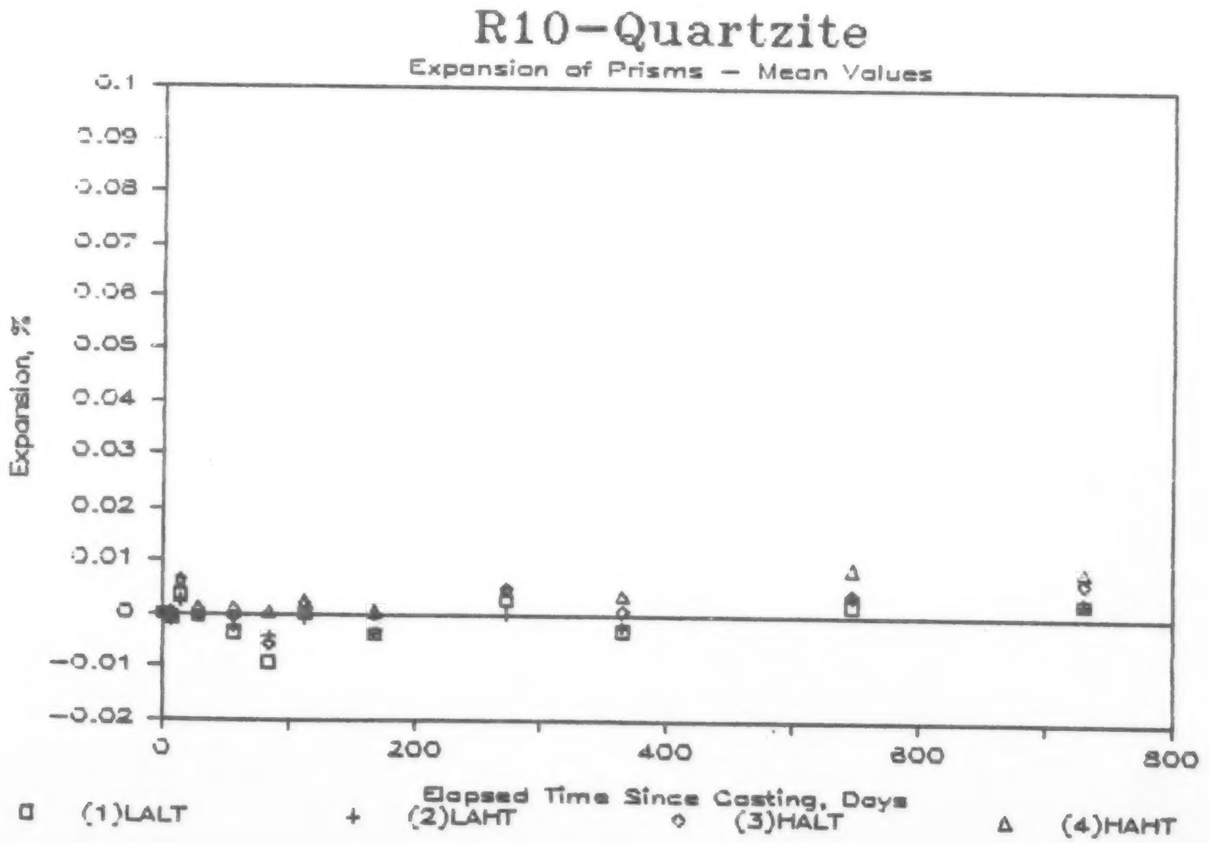

R7–Meta–greywacke
Expansion of Prisms – Mean Values
Expansion, %
0.5
0.4
0.3
0.2
0.1
0
–0.1
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT


R8–Greywacke
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT



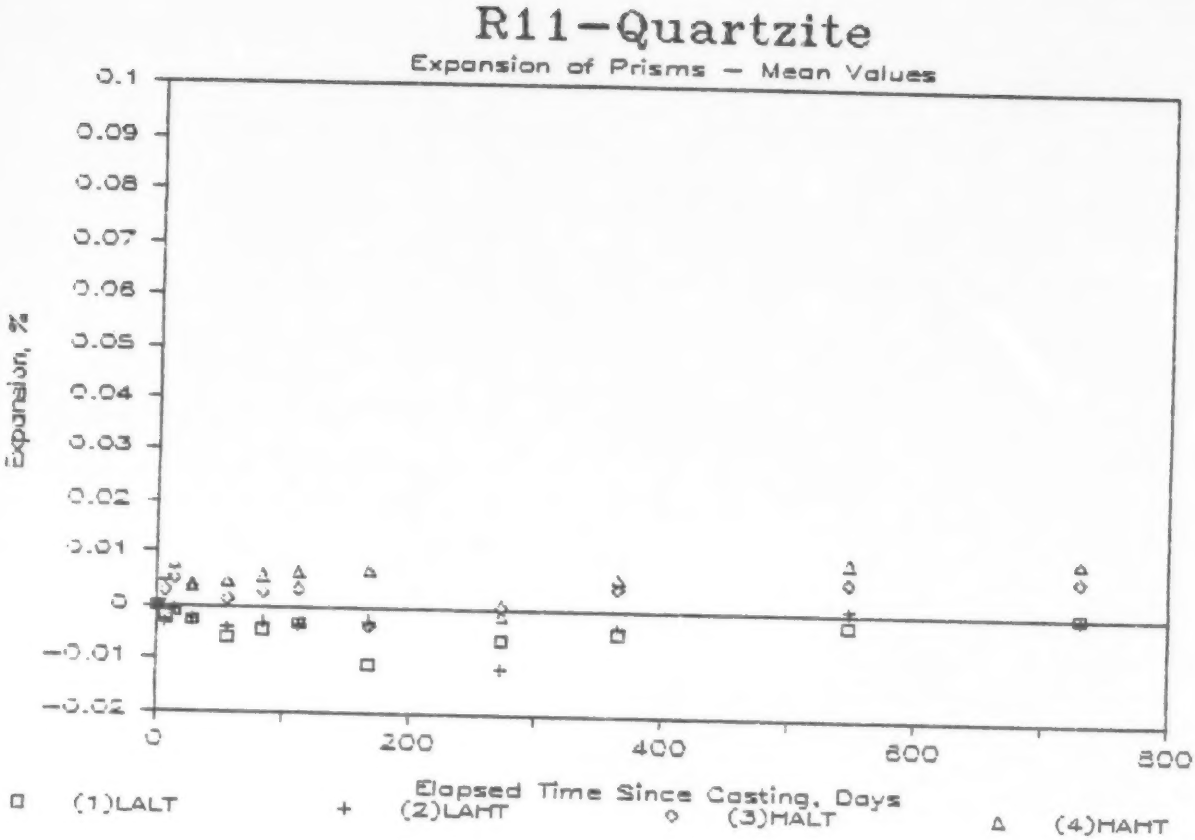
R9–Greywacke

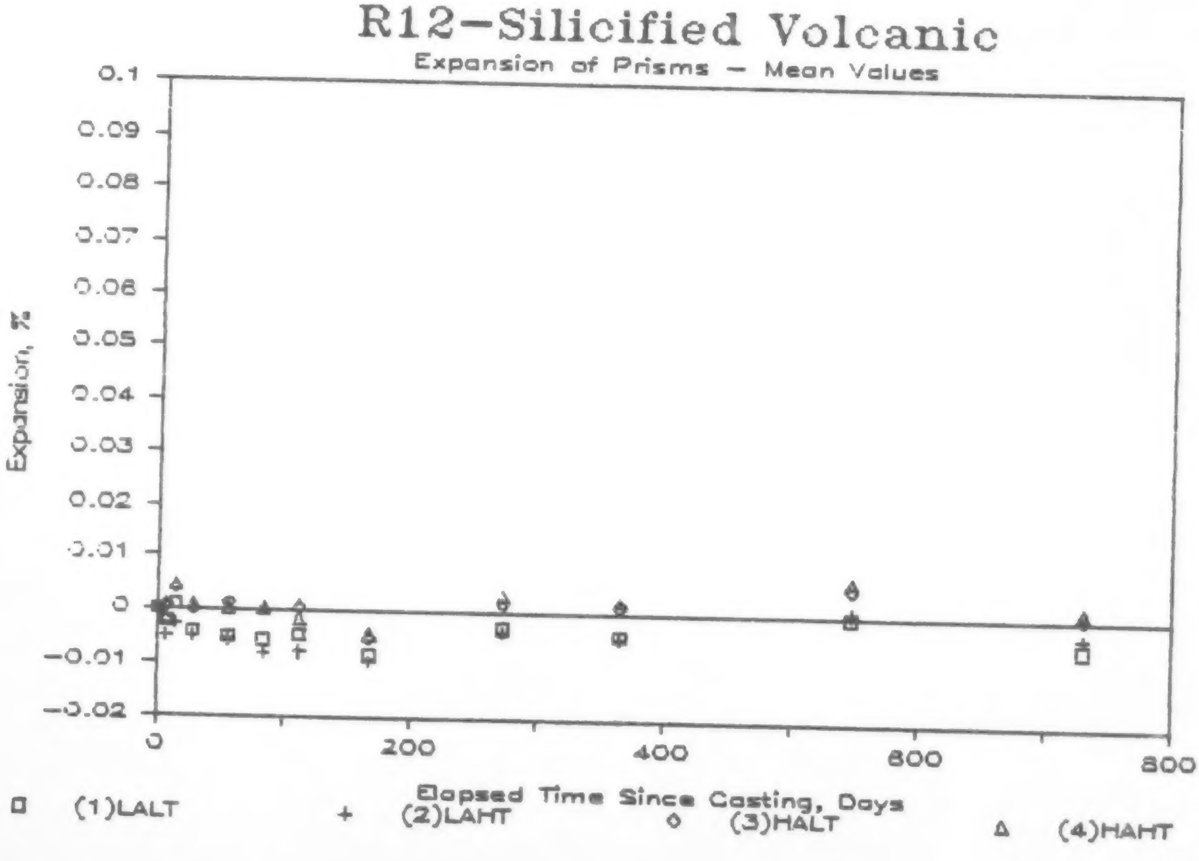
Expansion of Prisms – Mean Values



R10–Quartzite

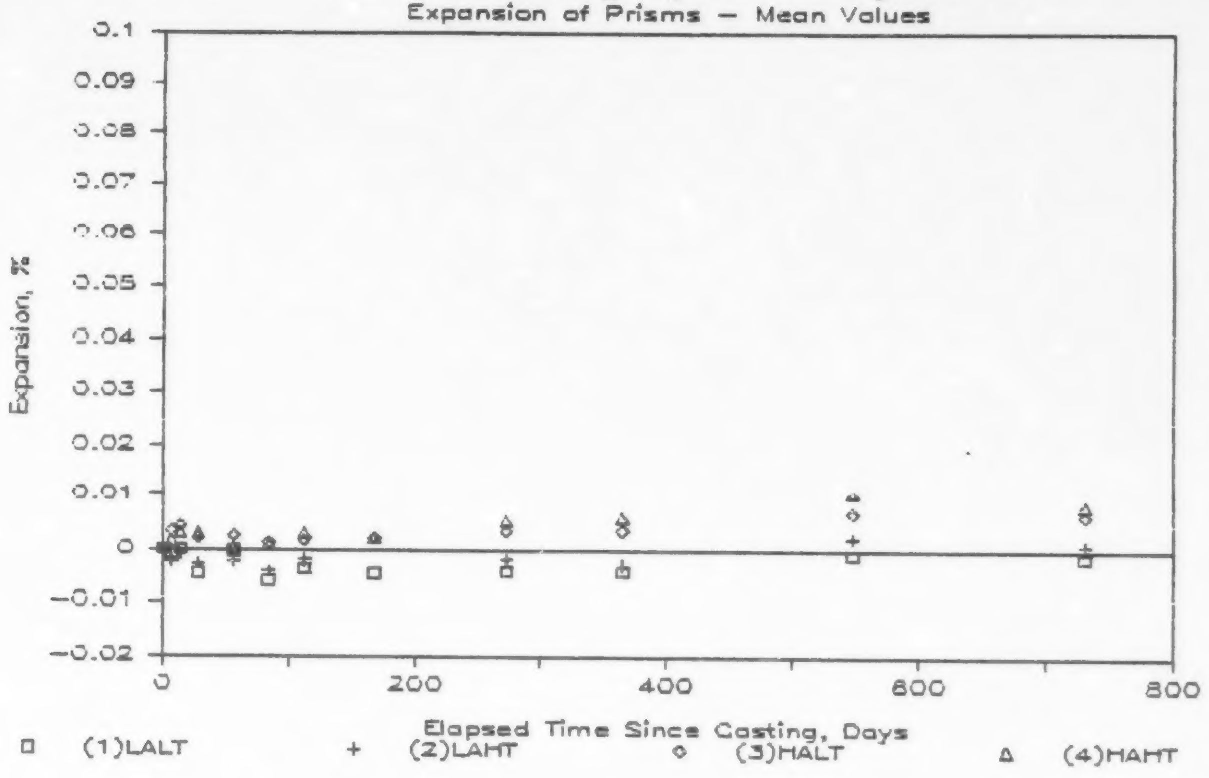
Expansion of Prisms – Mean Values


R11–Quartzite
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT


R12–Silicified Volcanic
Expansion of Prisms – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (1)LALT
+ (2)LAHT
◇ (3)HALT
△ (4)HAHT

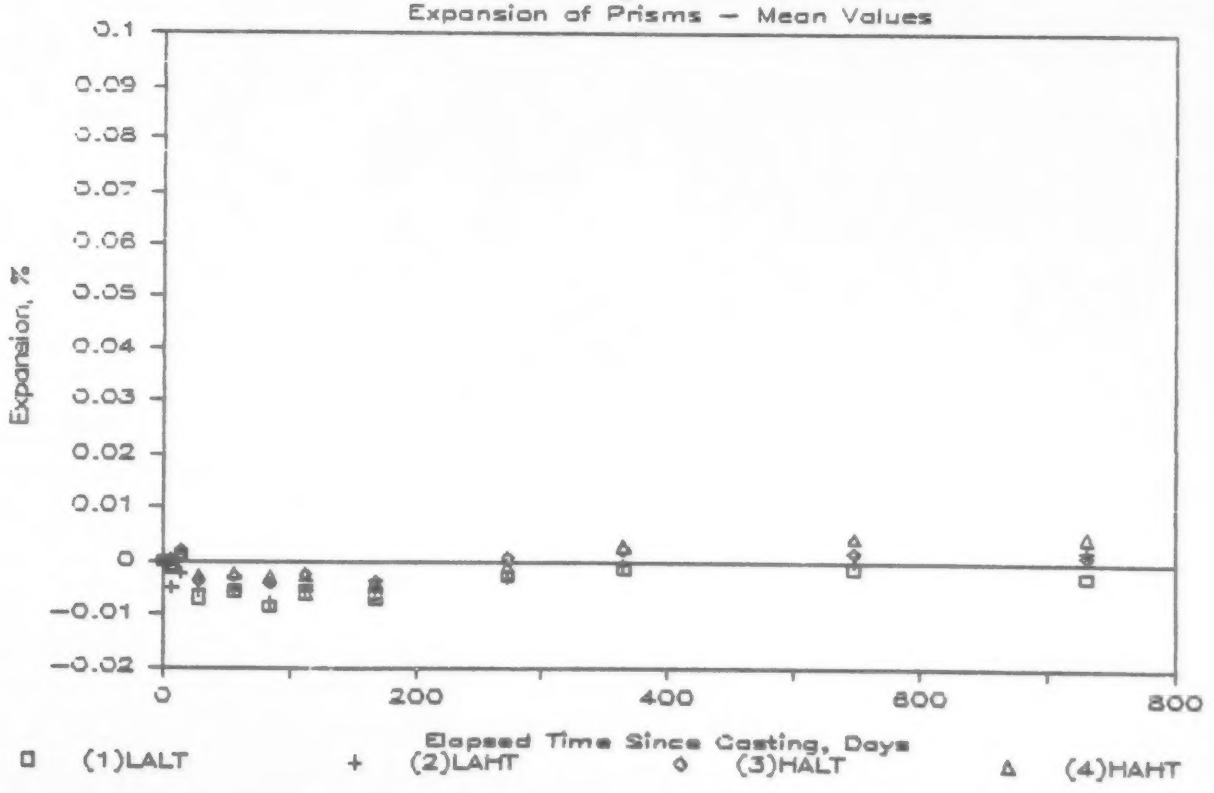
R13-Microphyric Rhyolite

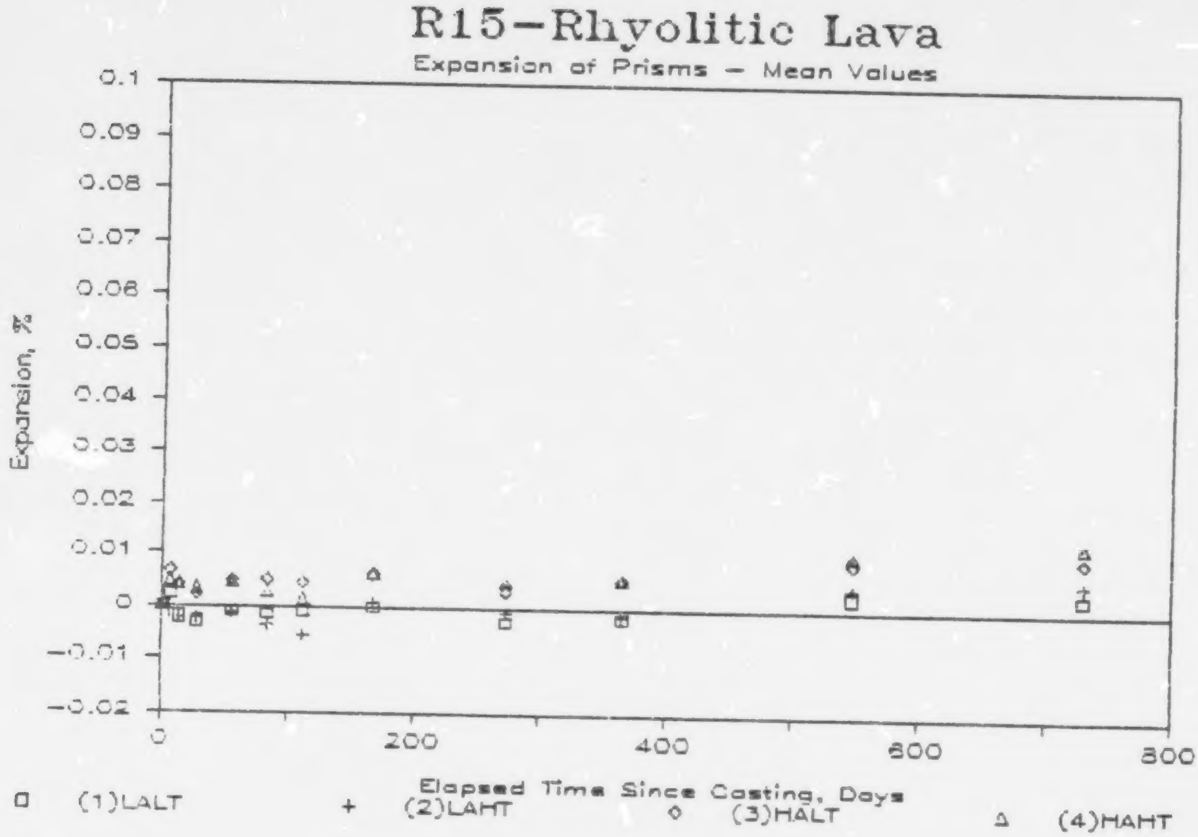
Expansion of Prisms — Mean Values



R14-Rhyolitic Tuff

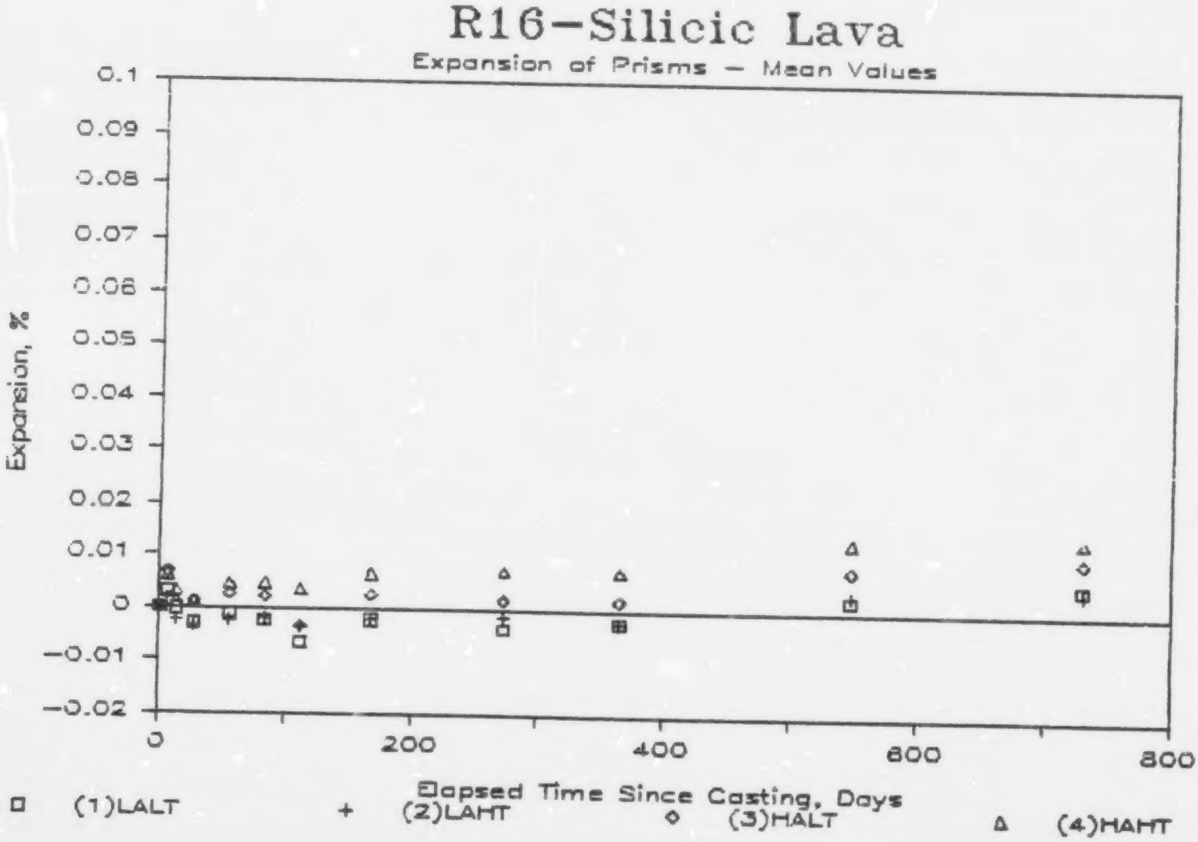
Expansion of Prisms — Mean Values





R15–Rhyolitic Lava

Expansion of Prisms – Mean Values

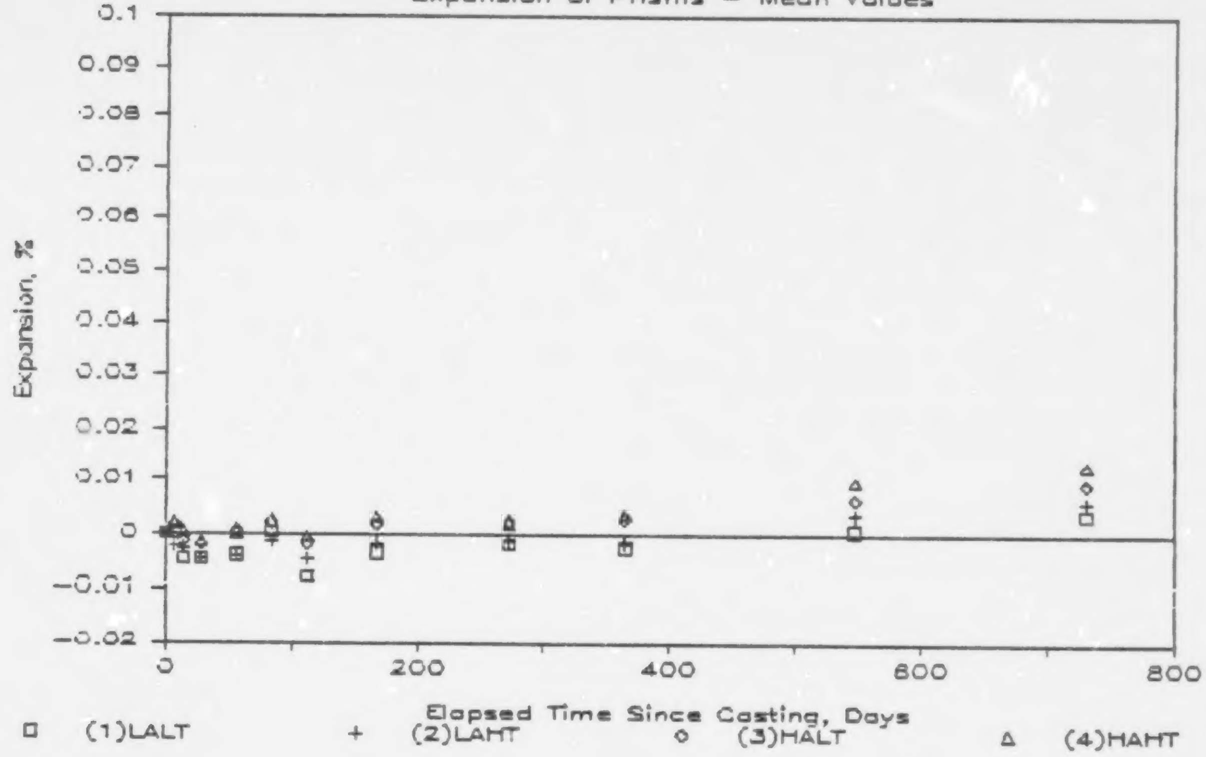


R16–Silicic Lava

Expansion of Prisms – Mean Values

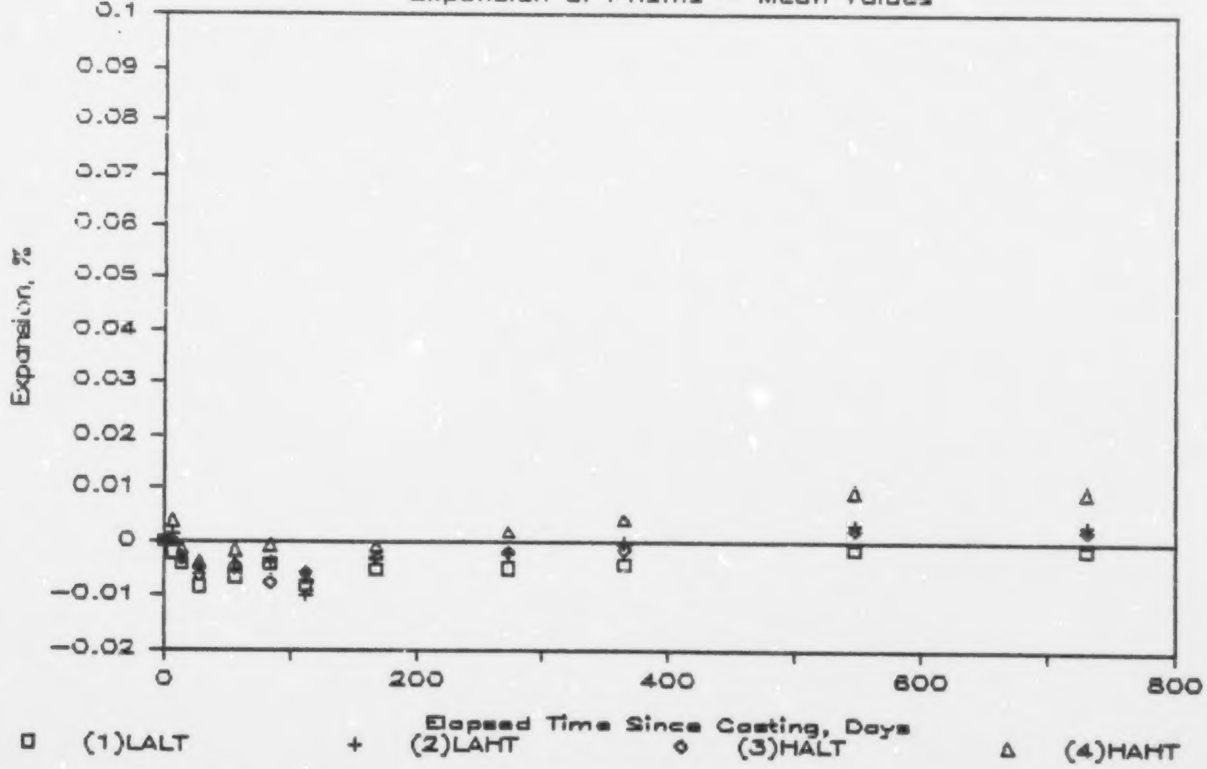
R17–Granite

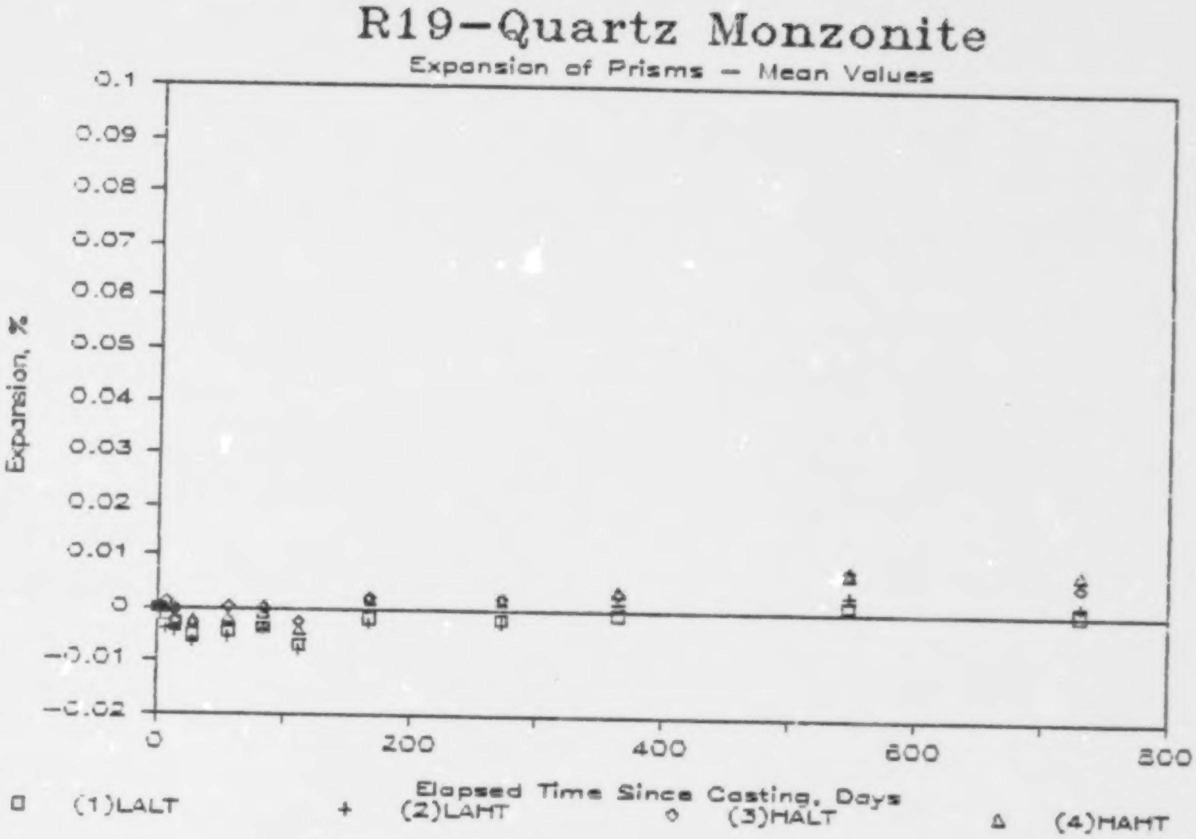
Expansion of Prisms – Mean Values



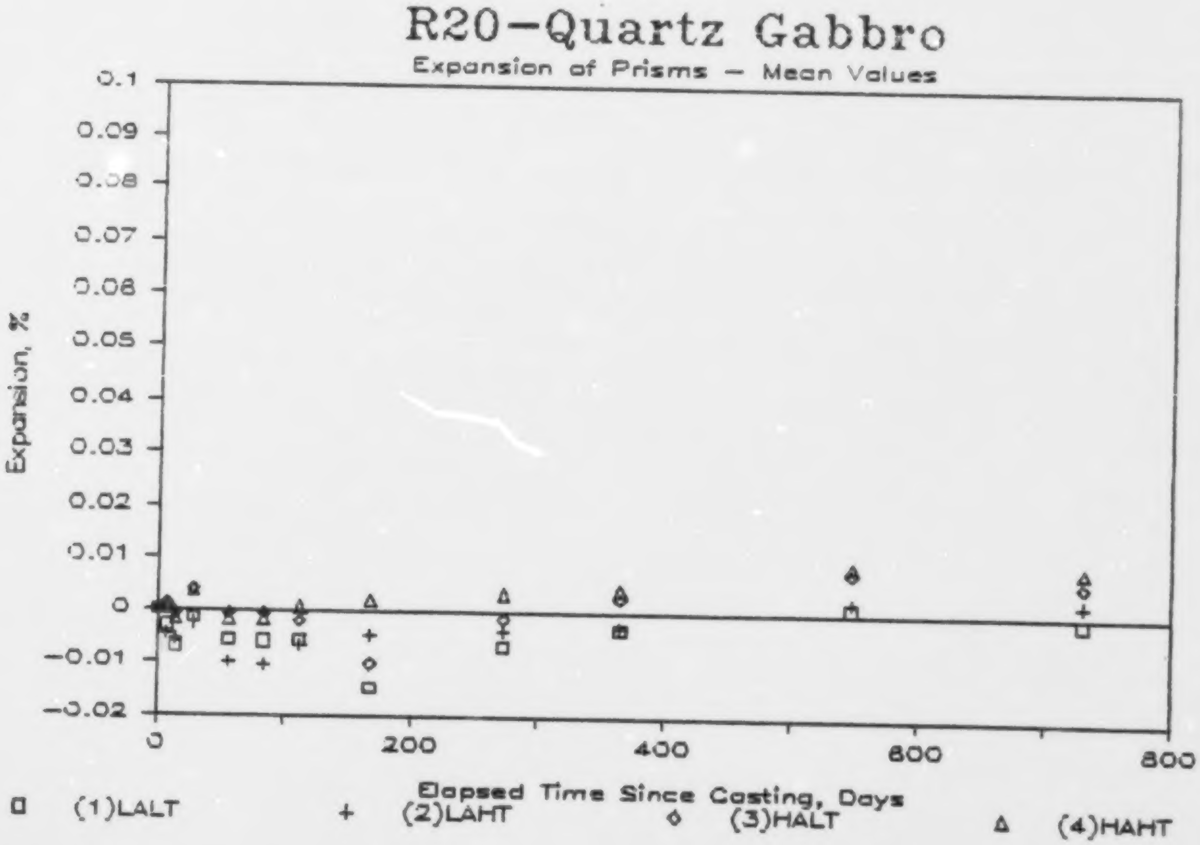
R18–Granite

Expansion of Prisms – Mean Values




R19–Quartz Monzonite

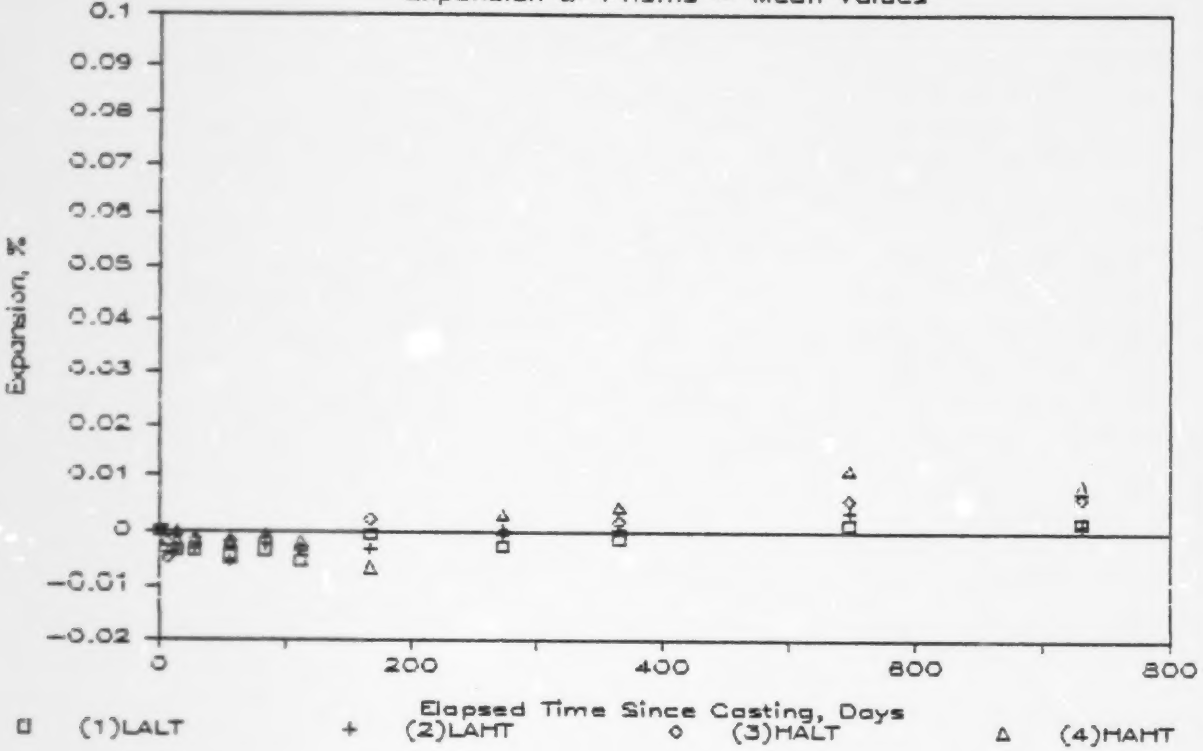
Expansion of Prisms – Mean Values


R20–Quartz Gabbro

Expansion of Prisms – Mean Values

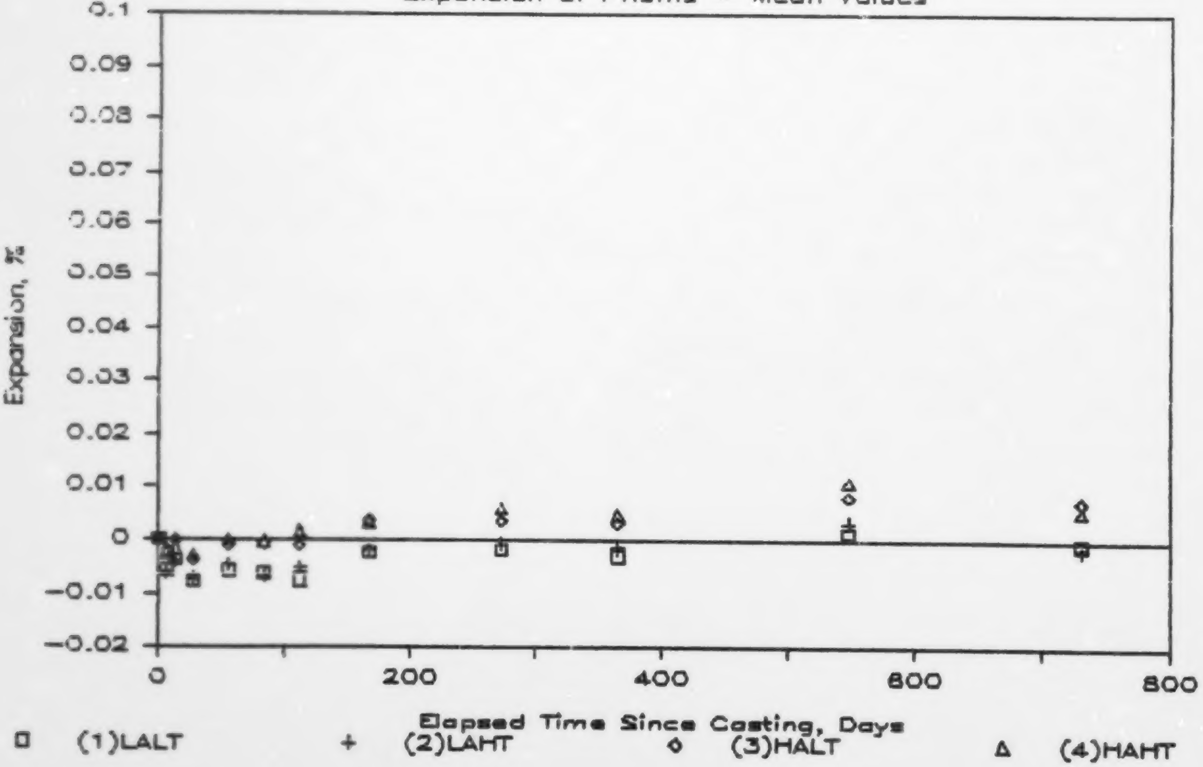
R21–Chloritized Basalt

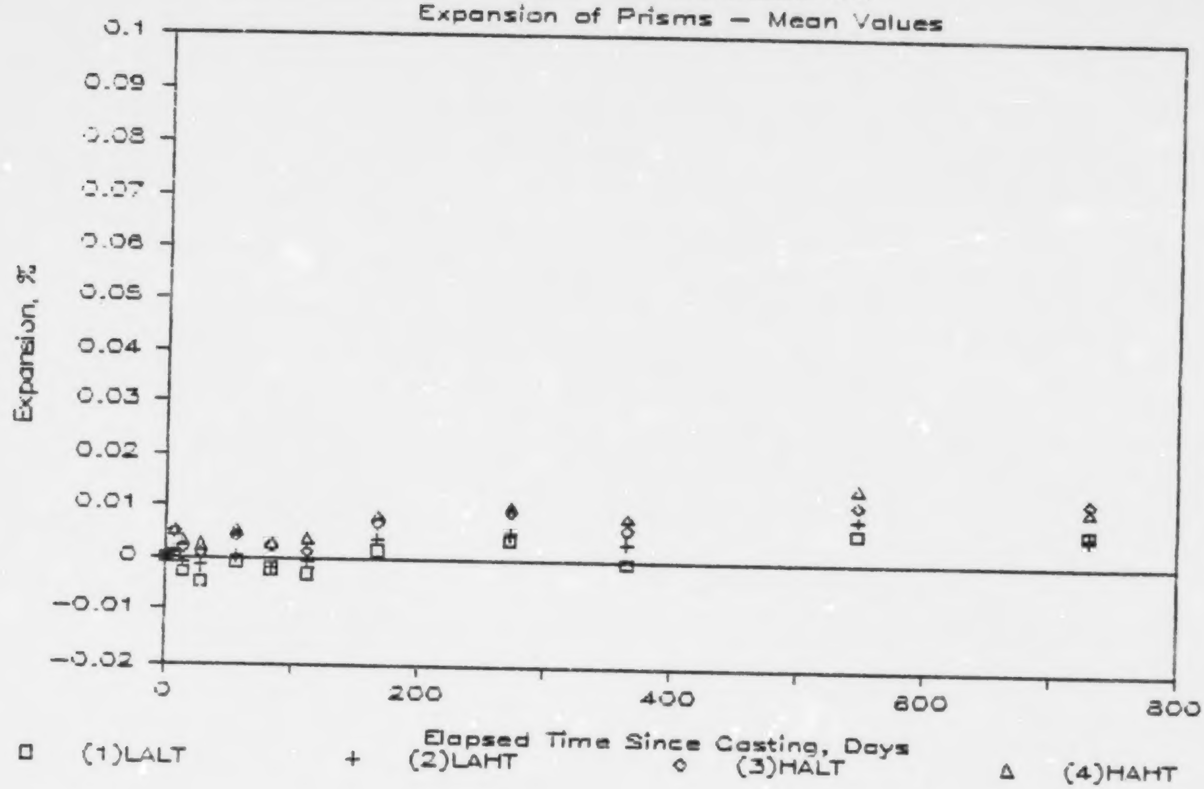
Expansion of Prisms – Mean Values



R22–Limestone

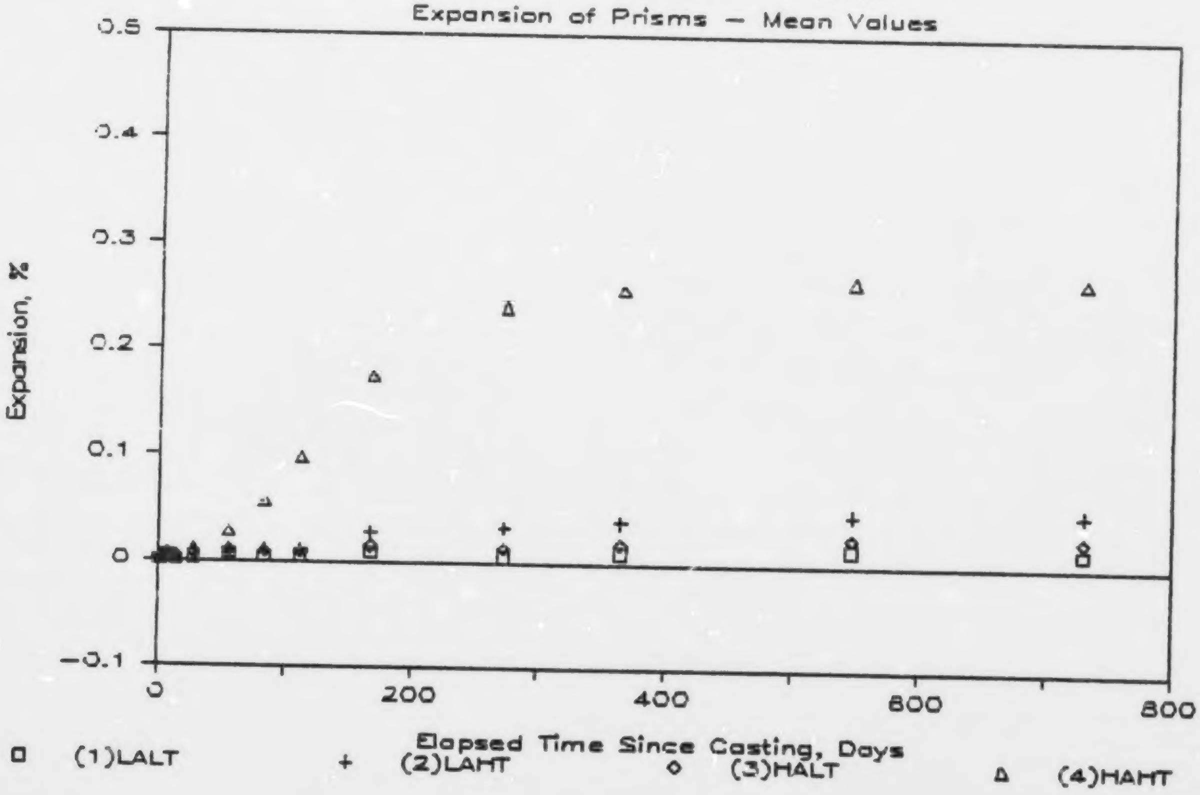
Expansion of Prisms – Mean Values





R23–Dolomite

Expansion of Prisms – Mean Values

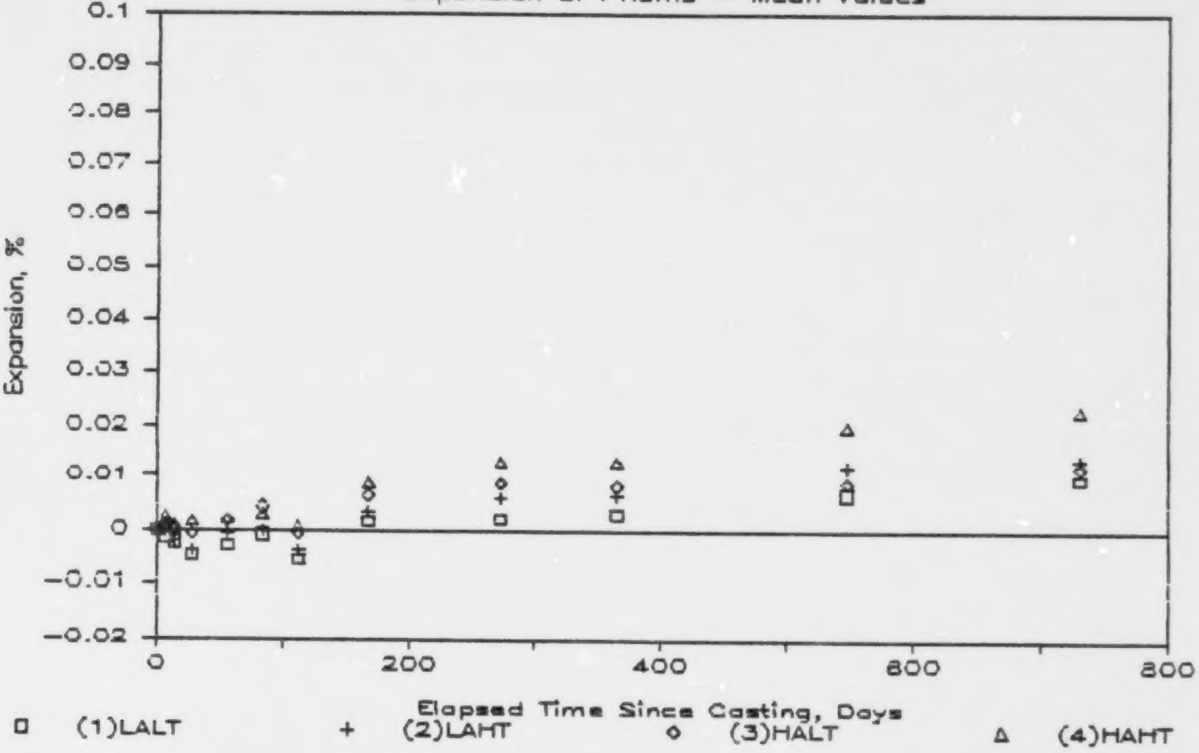


R24–Limestone

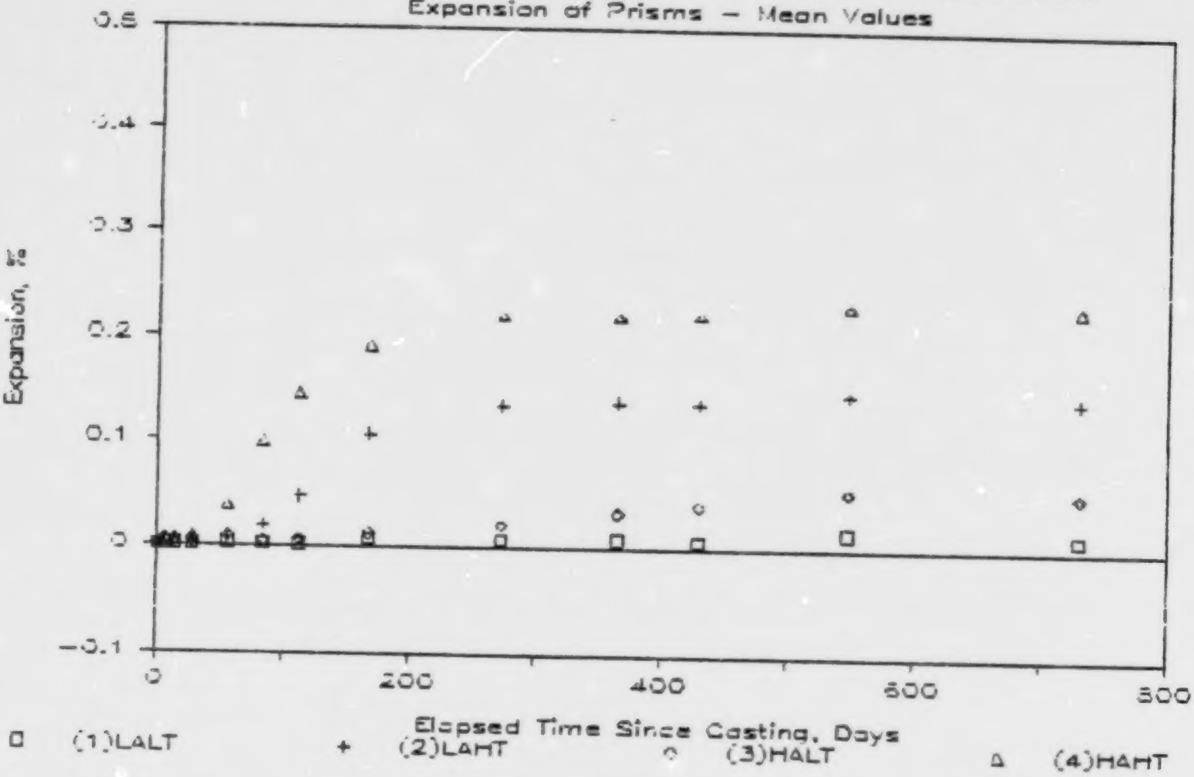
Expansion of Prisms – Mean Values

R25—Limestone

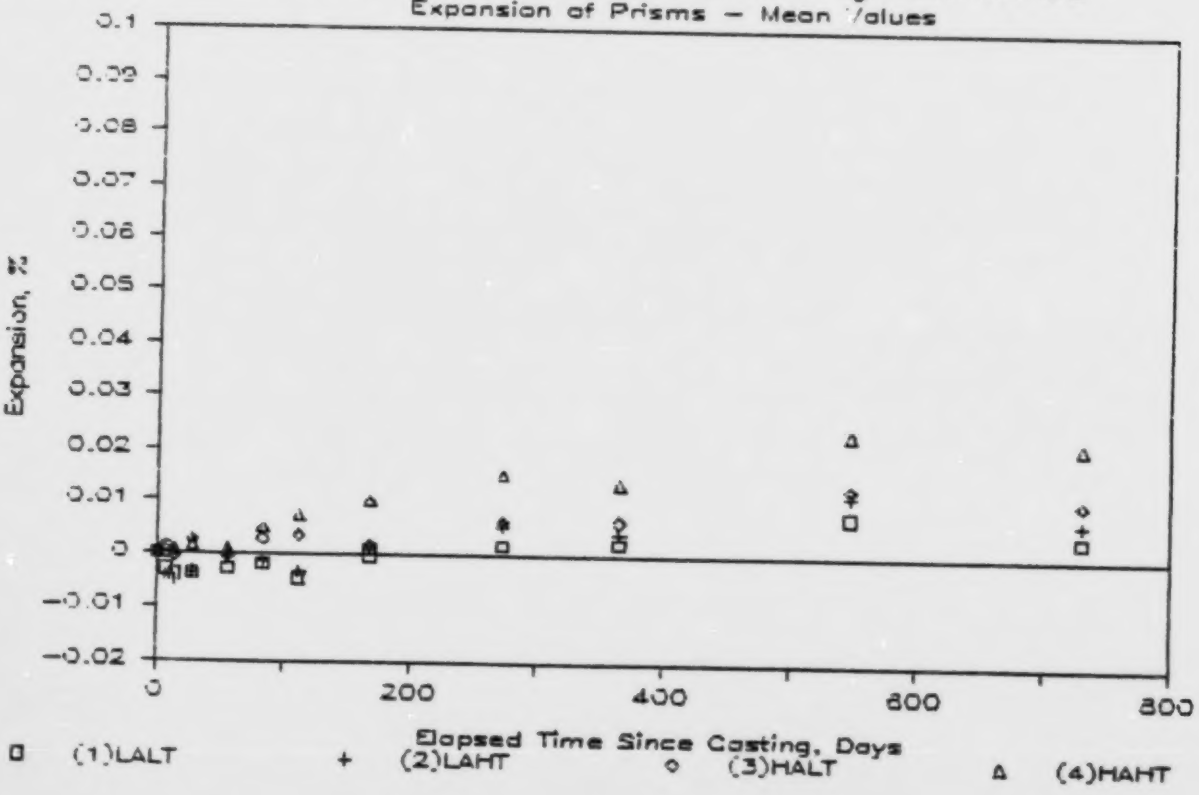
Expansion of Prisms — Mean Values



CR1–Control–Spratt Limestone

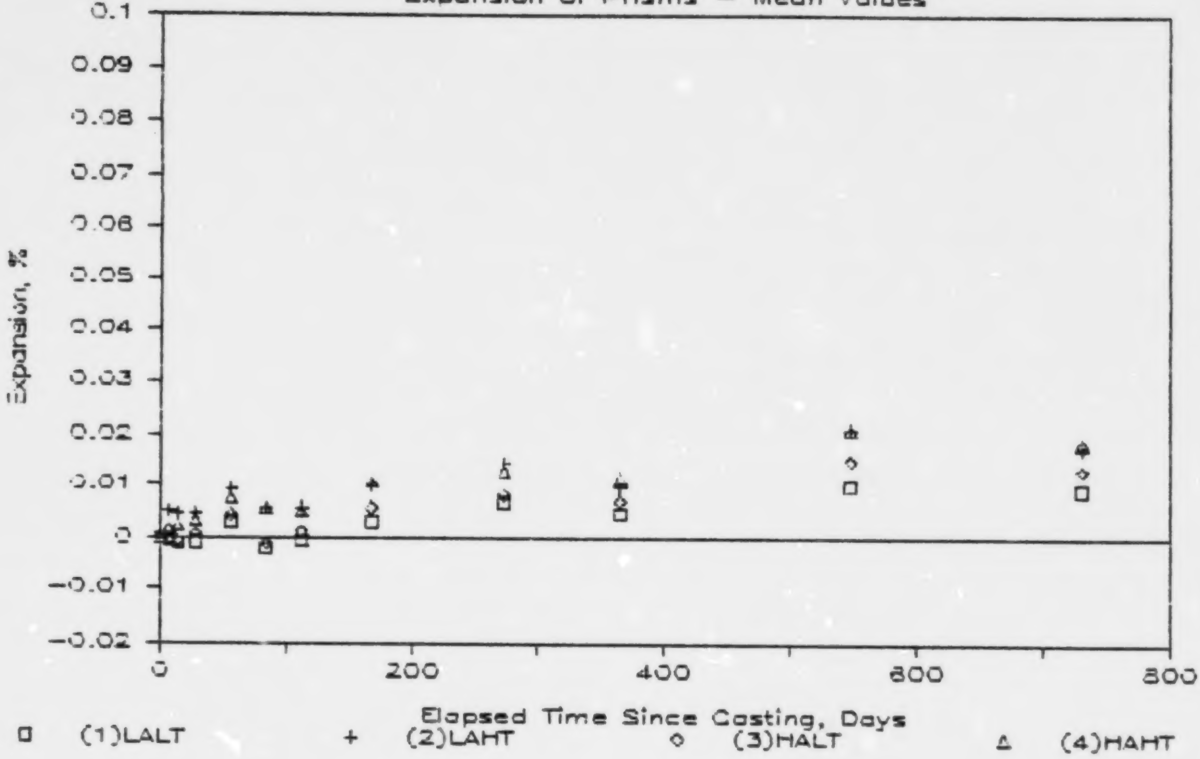


CG2–Control–Sudbury Gravel



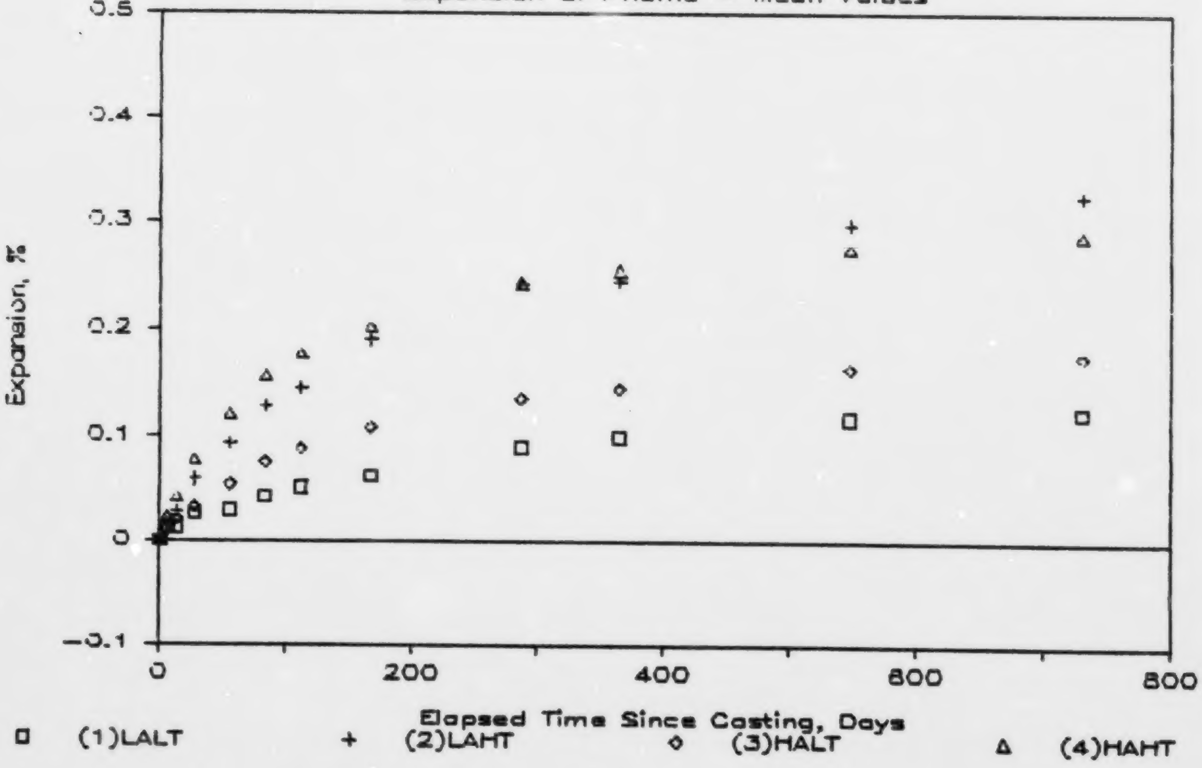
CR3—Control—Nelson

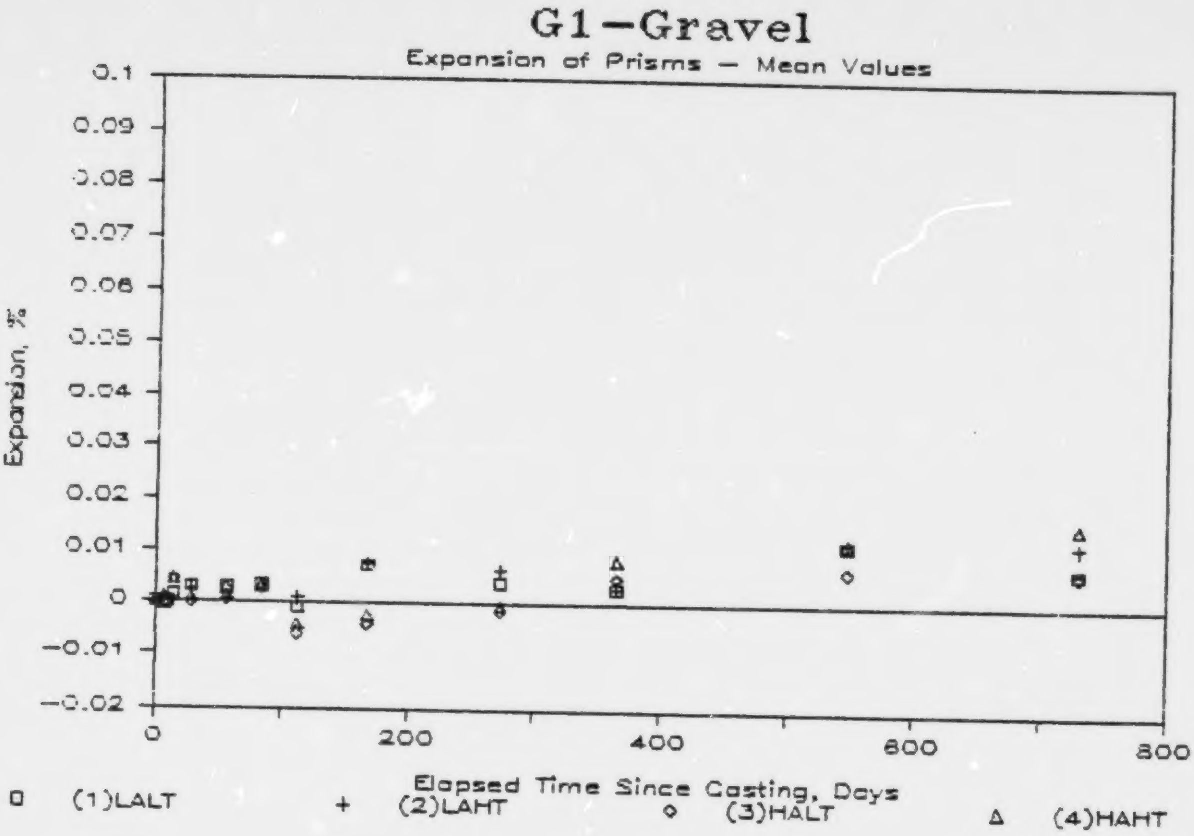
Expansion of Prisms — Mean Values



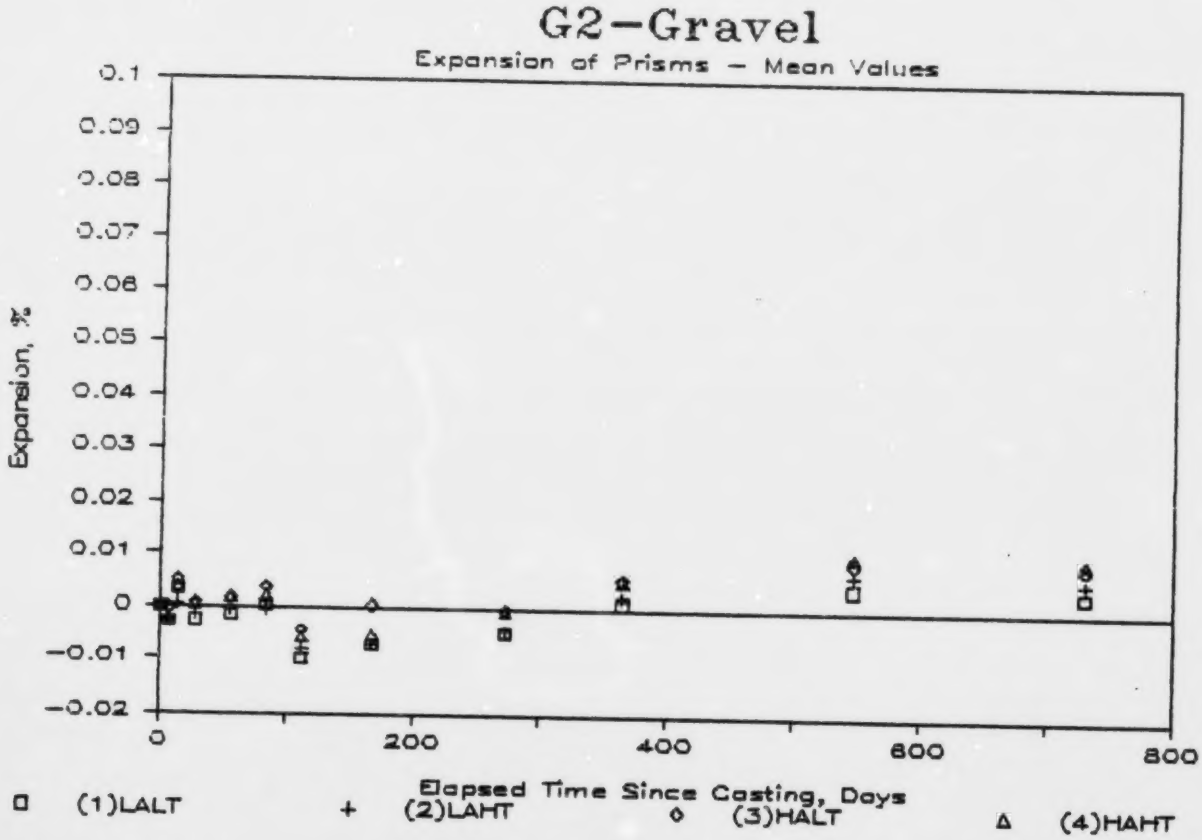
CR4—Control—Pittsburgh Limestone

Expansion of Prisms — Mean Values




G1–Gravel

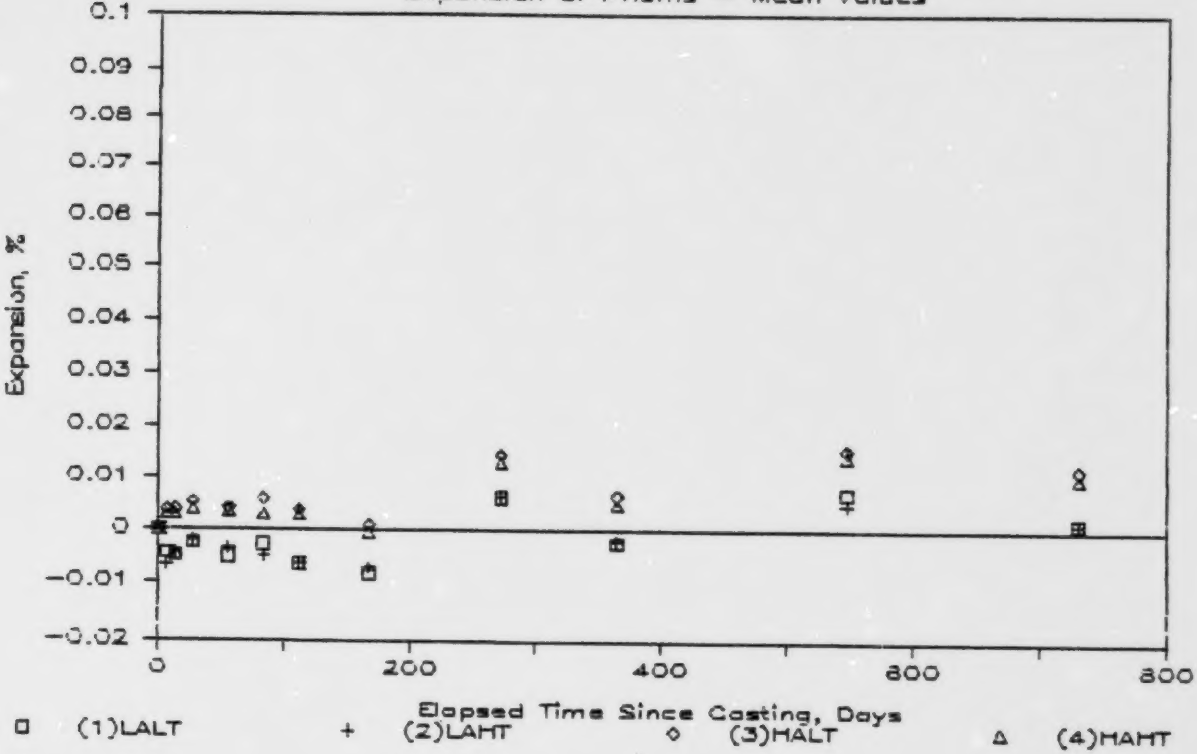
Expansion of Prisms – Mean Values


G2–Gravel

Expansion of Prisms – Mean Values

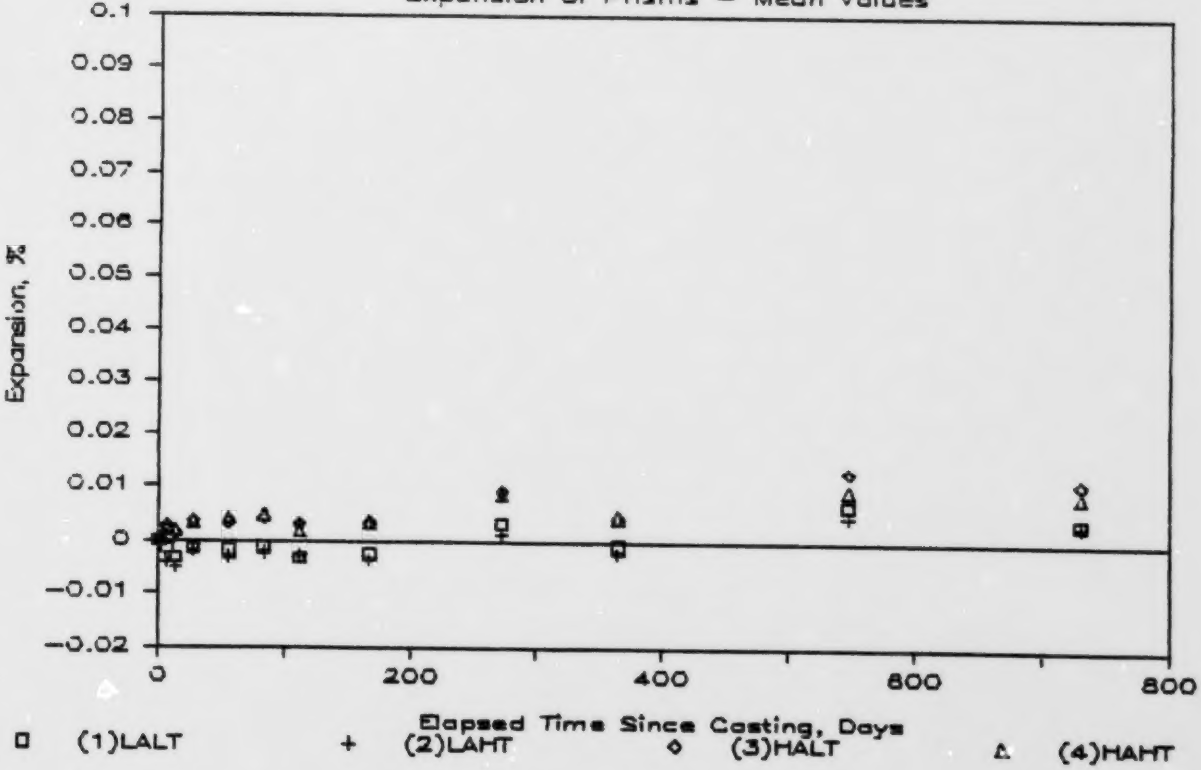
G3–Gravel

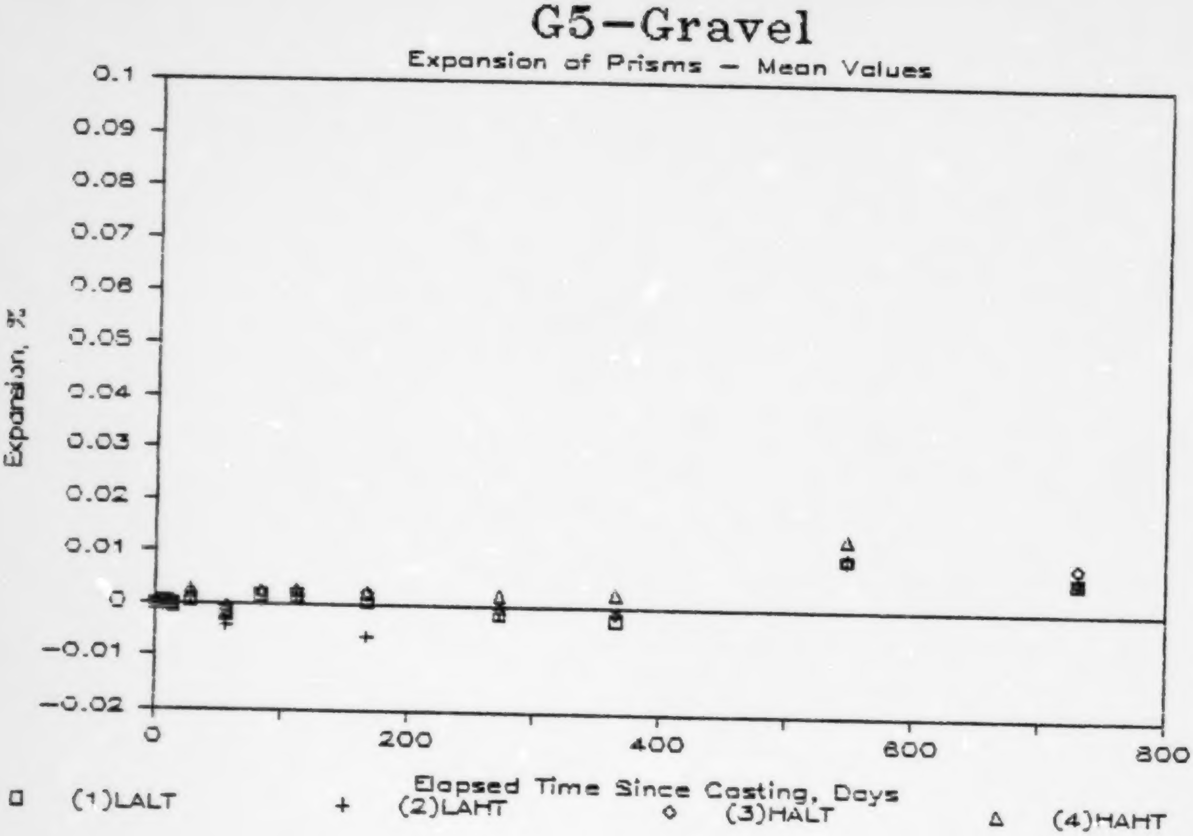
Expansion of Prisms – Mean Values



G4–Gravel

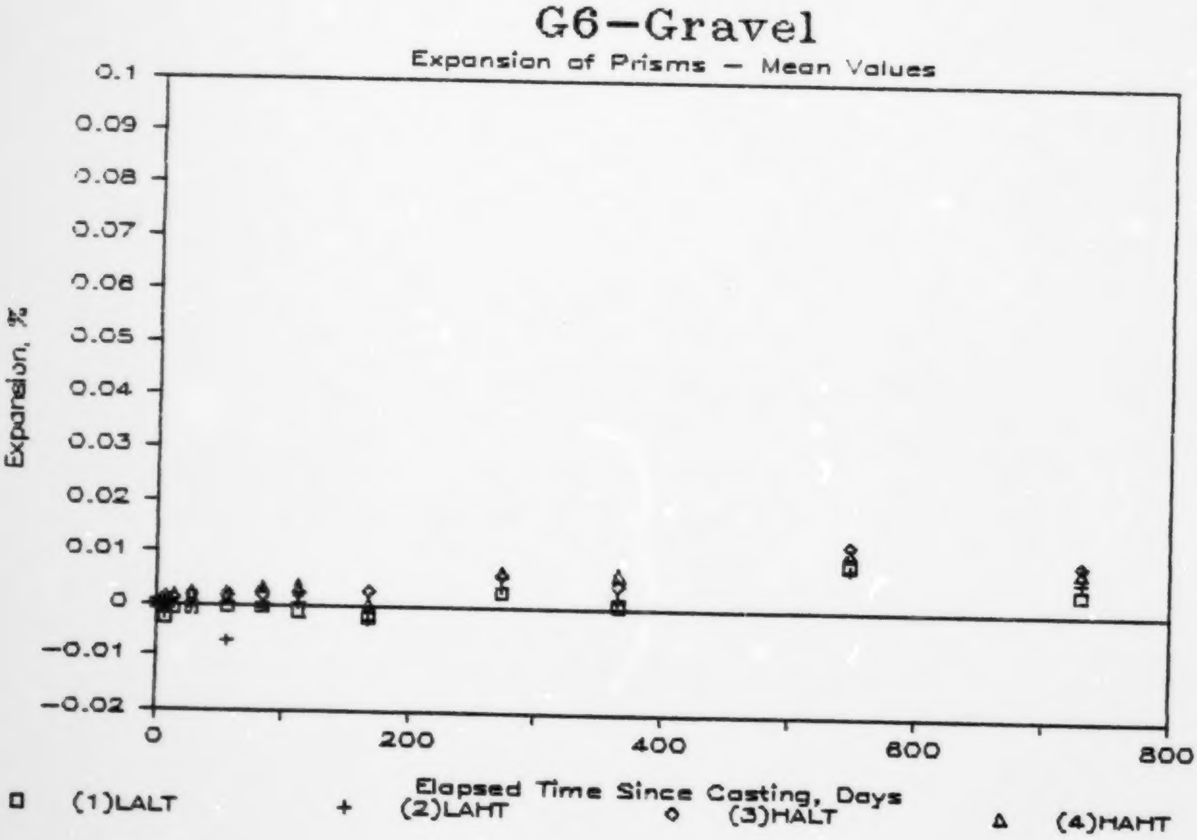
Expansion of Prisms – Mean Values





G5−Gravel

Expansion of Prisms − Mean Values

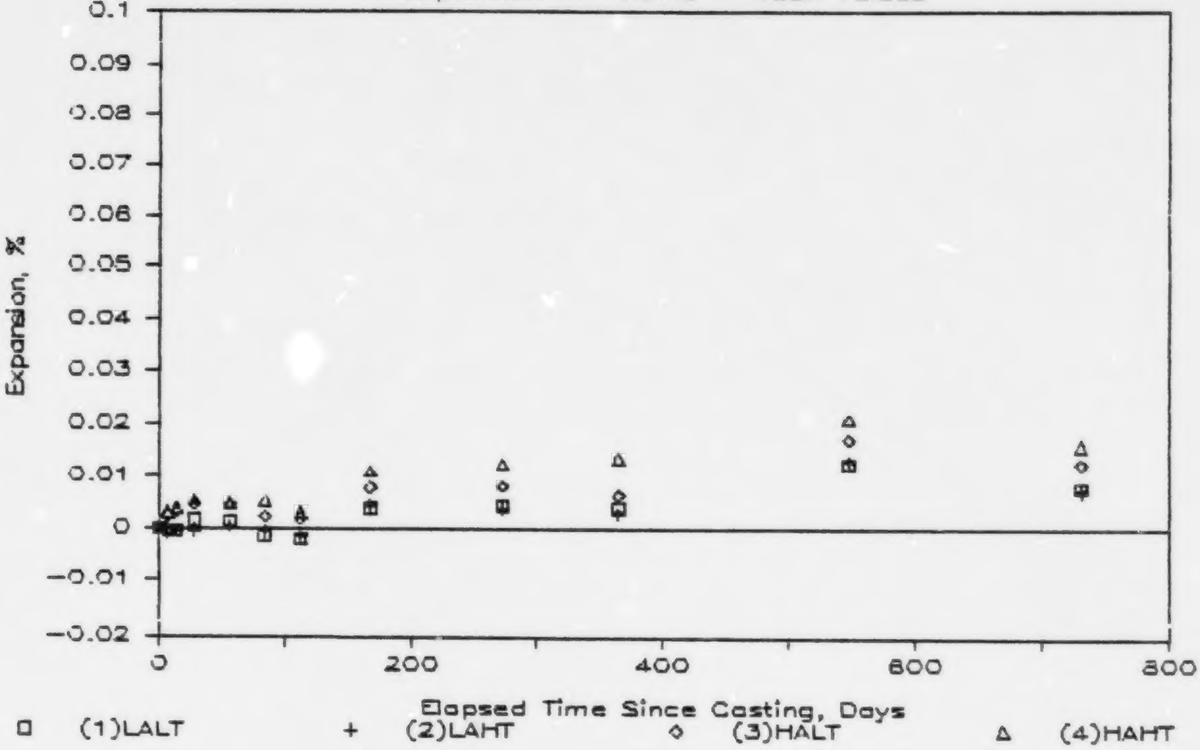


G6−Gravel

Expansion of Prisms − Mean Values

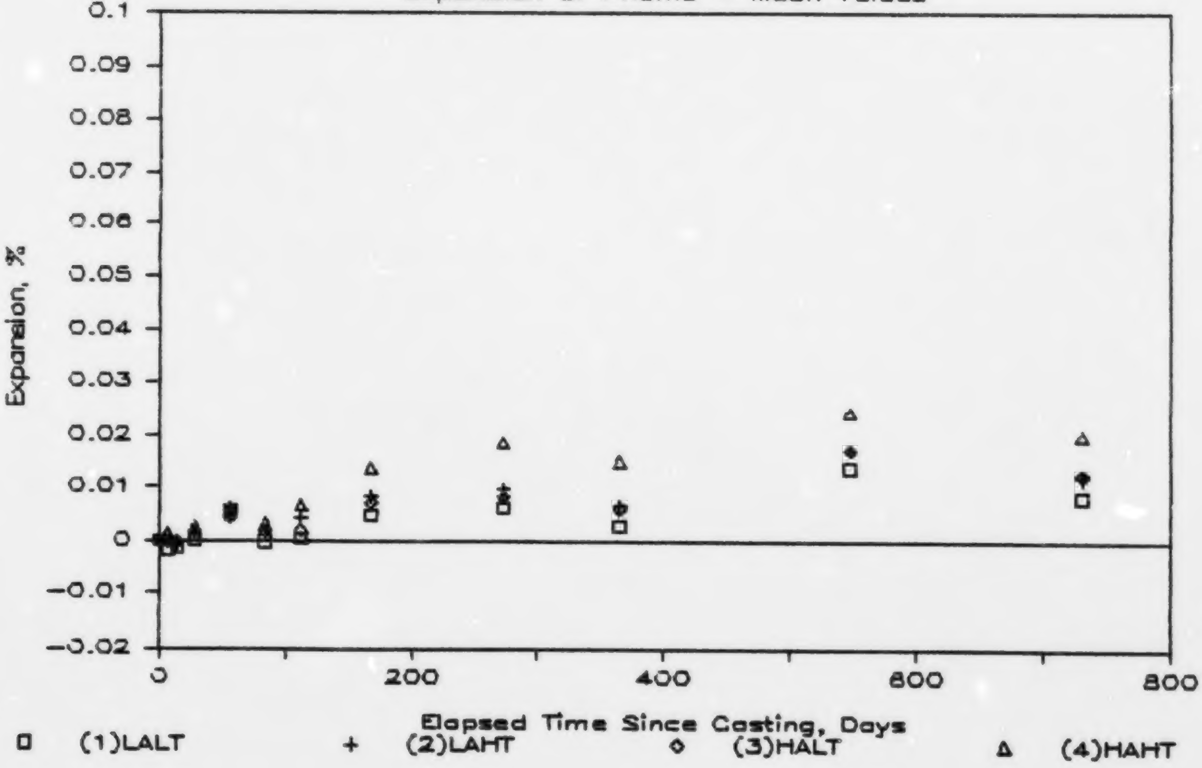
G7−Gravel

Expansion of Prisms − Mean Values

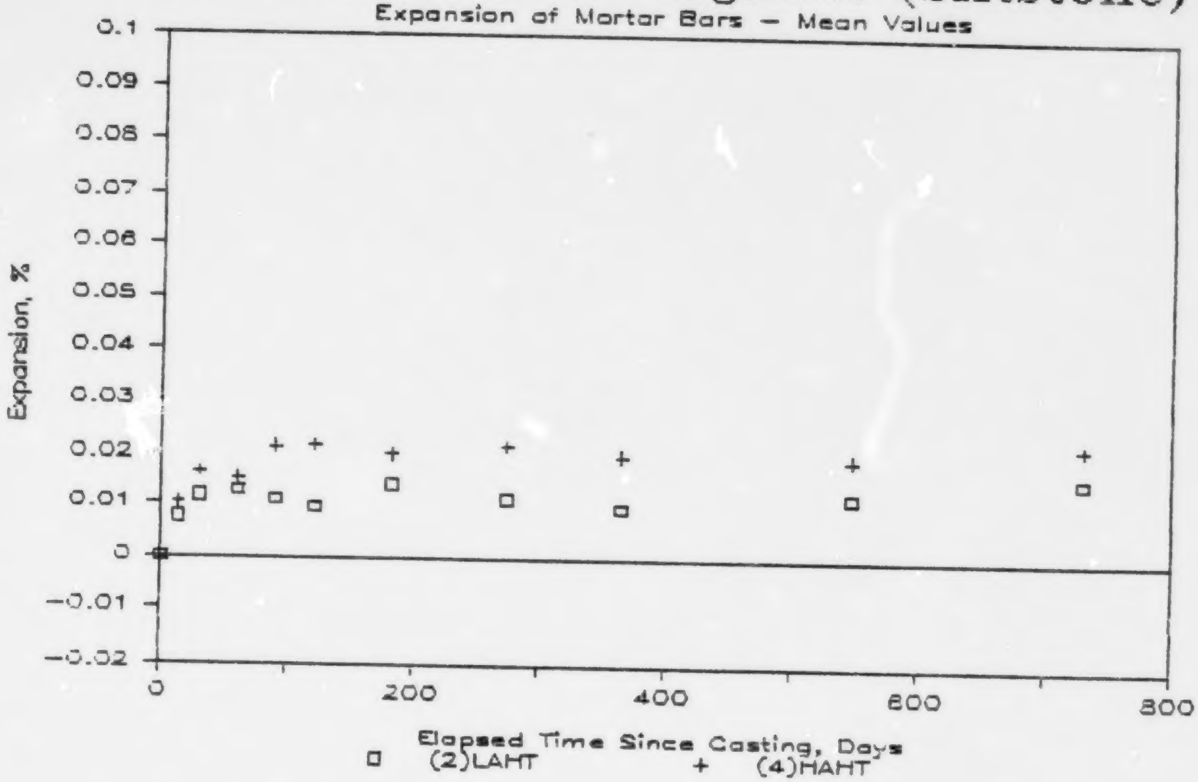


G8−Gravel

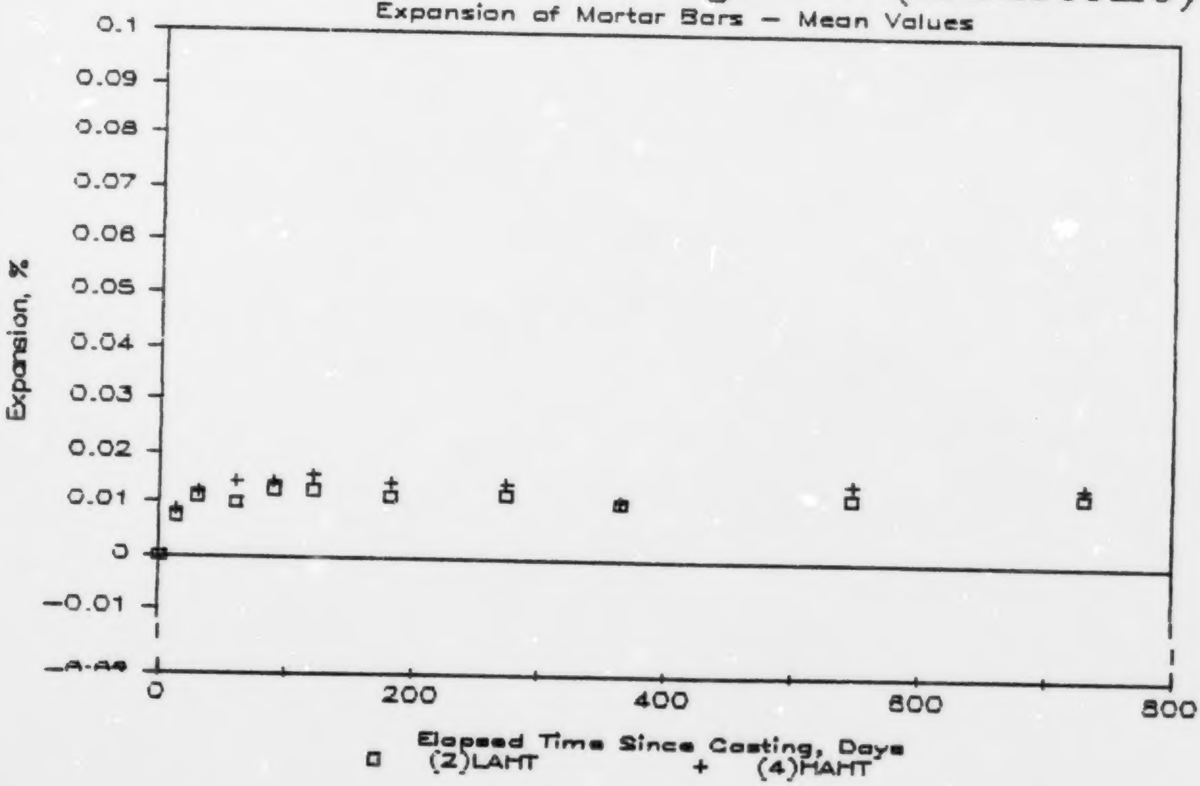
Expansion of Prisms − Mean Values

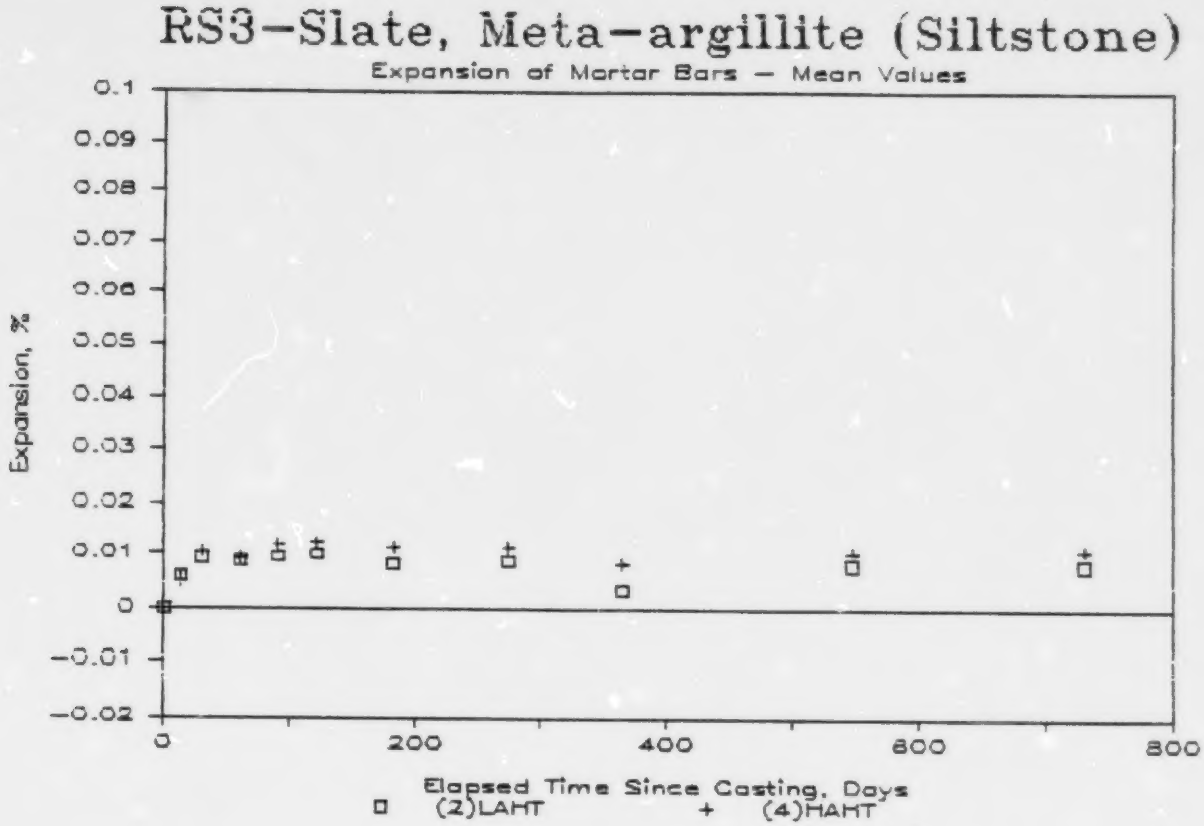


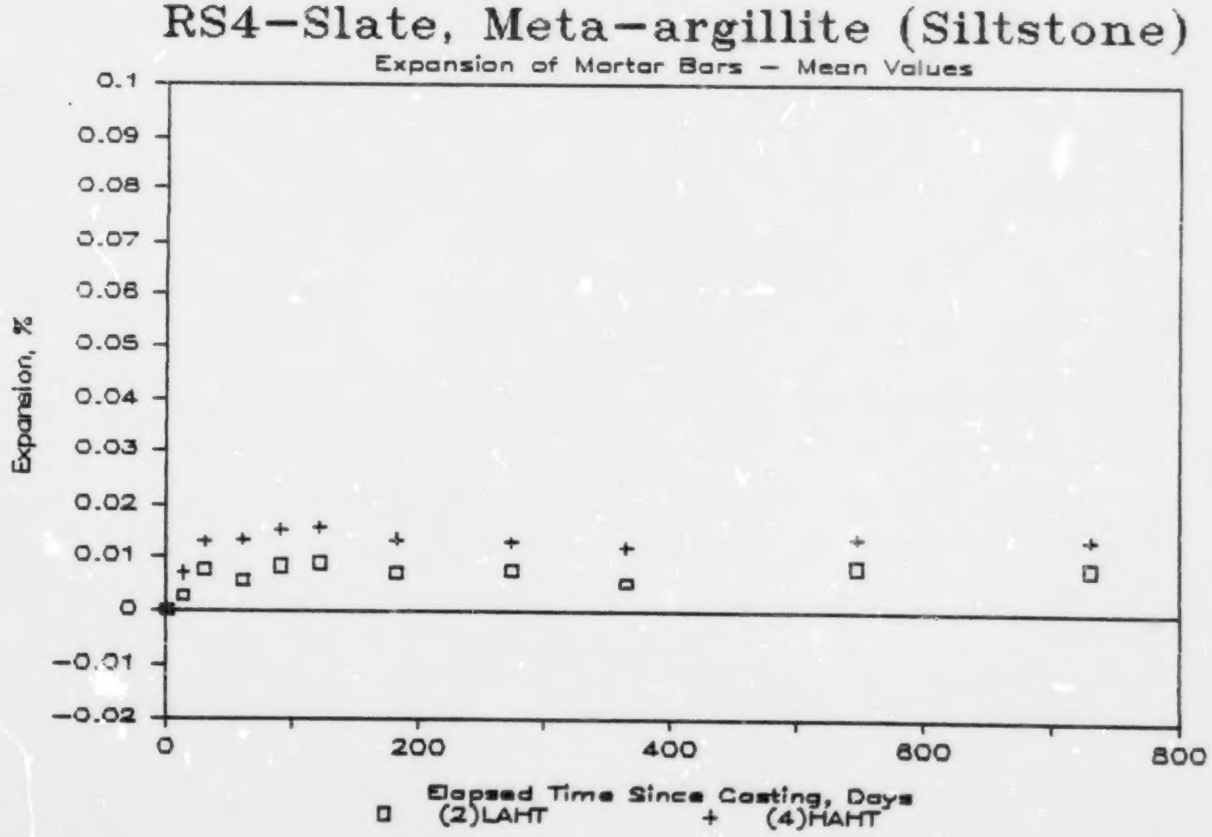
RS1–Slate, Meta–argillite (Siltstone)

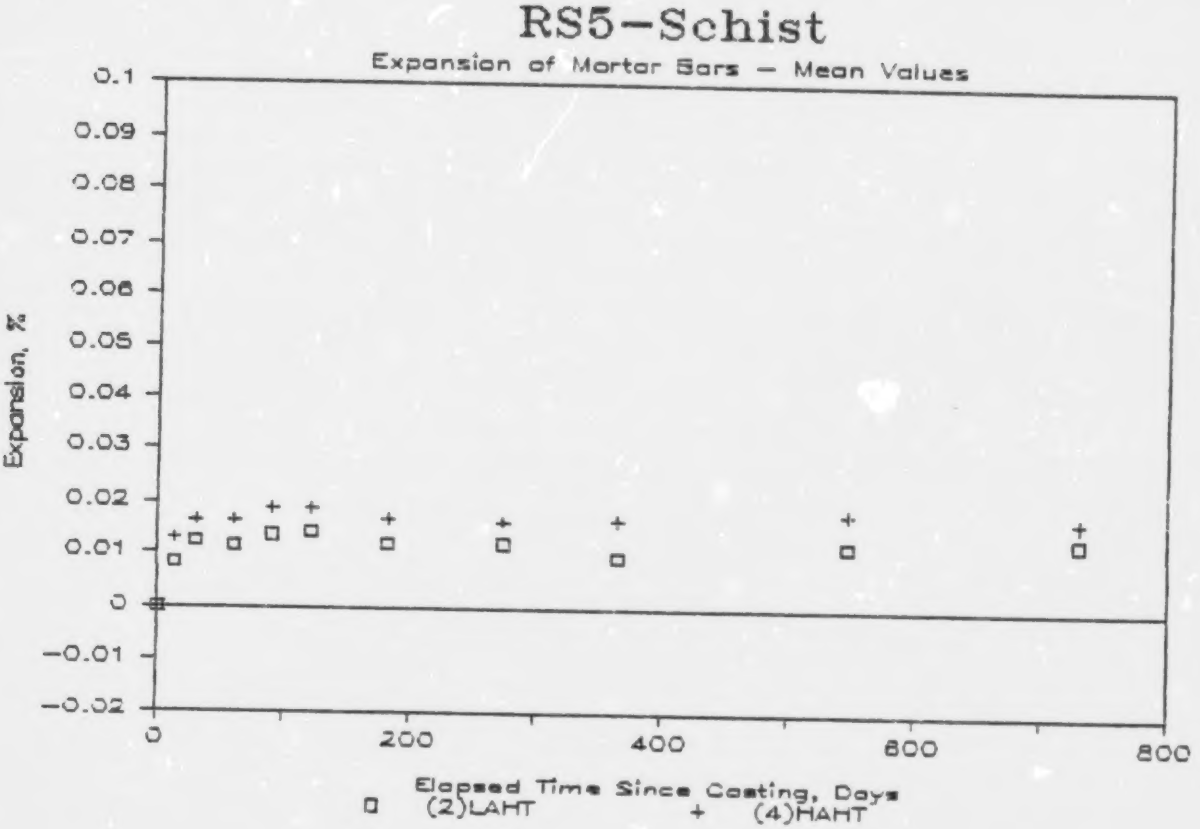


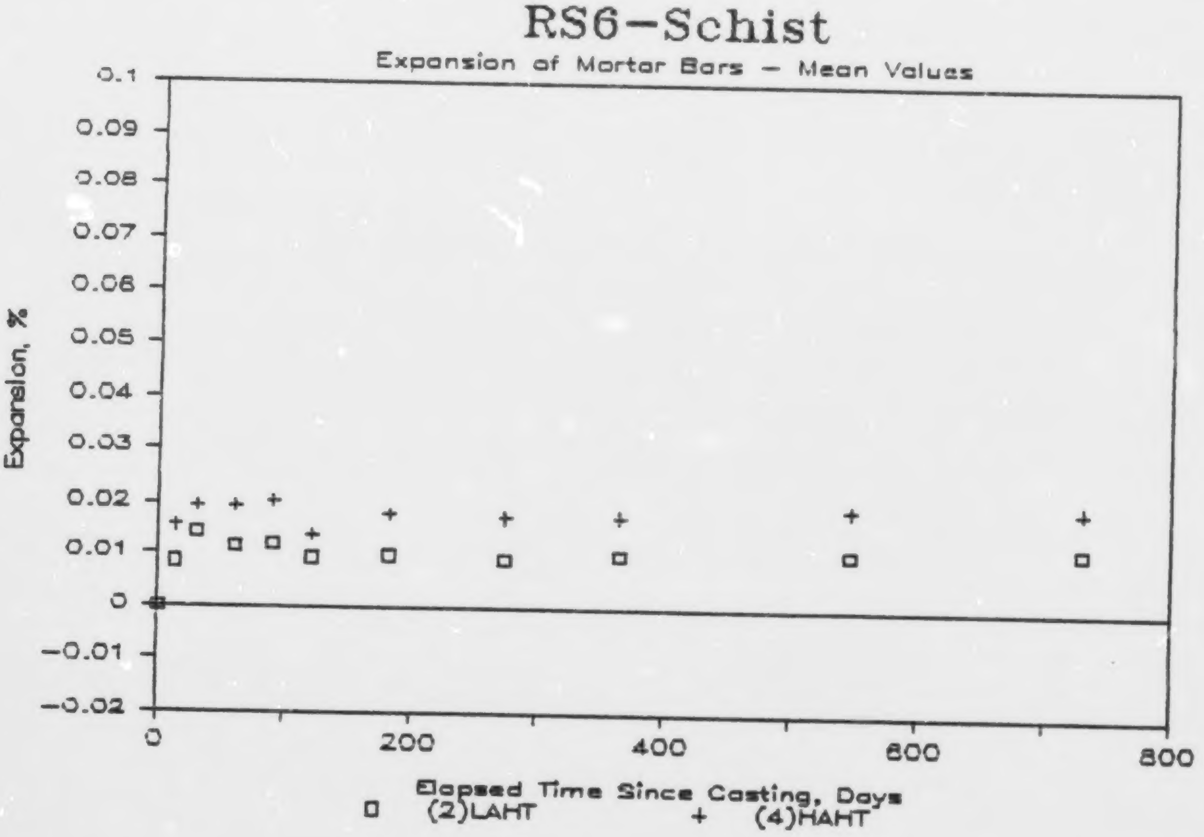
RS2–Slate, Meta–argillite (Mudstone)




RS3–Slate, Meta–argillite (Siltstone)
Expansion of Mortar Bars — Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

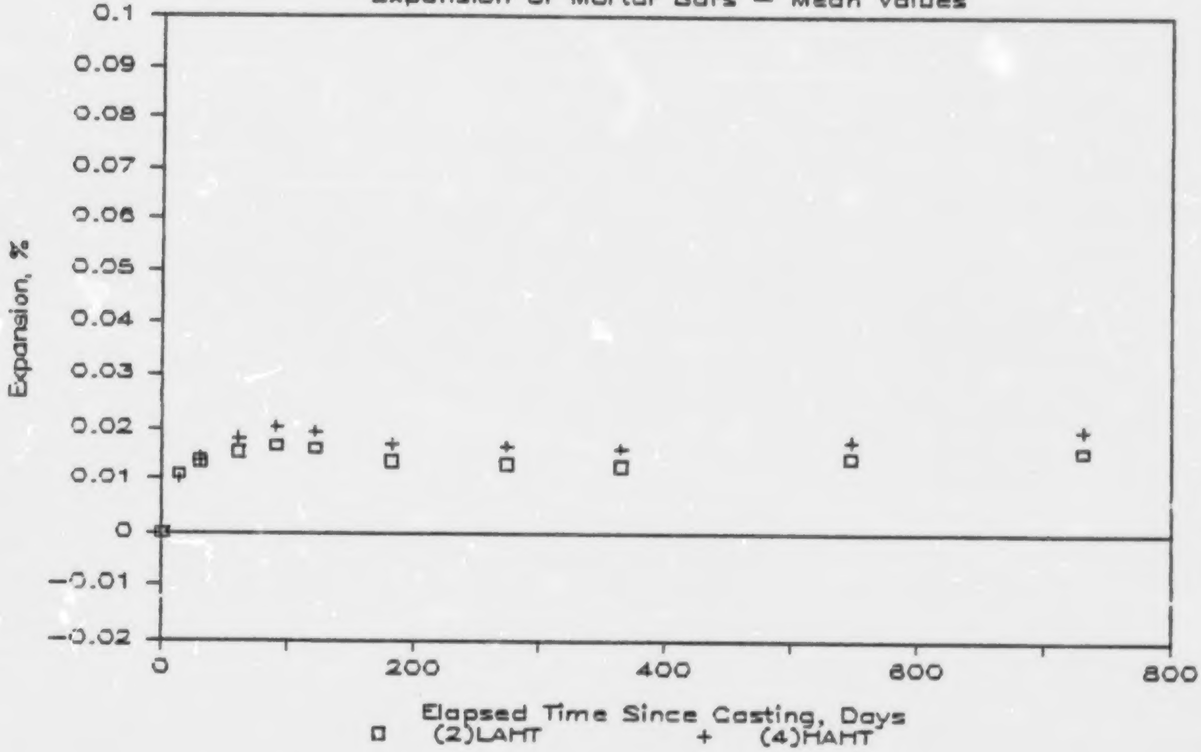

RS4–Slate, Meta–argillite (Siltstone)
Expansion of Mortar Bars — Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
−0.01
−0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT


RS5-Schist
Expansion of Mortar Bars - Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
800
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT


RS6-Schist
Expansion of Mortar Bars - Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

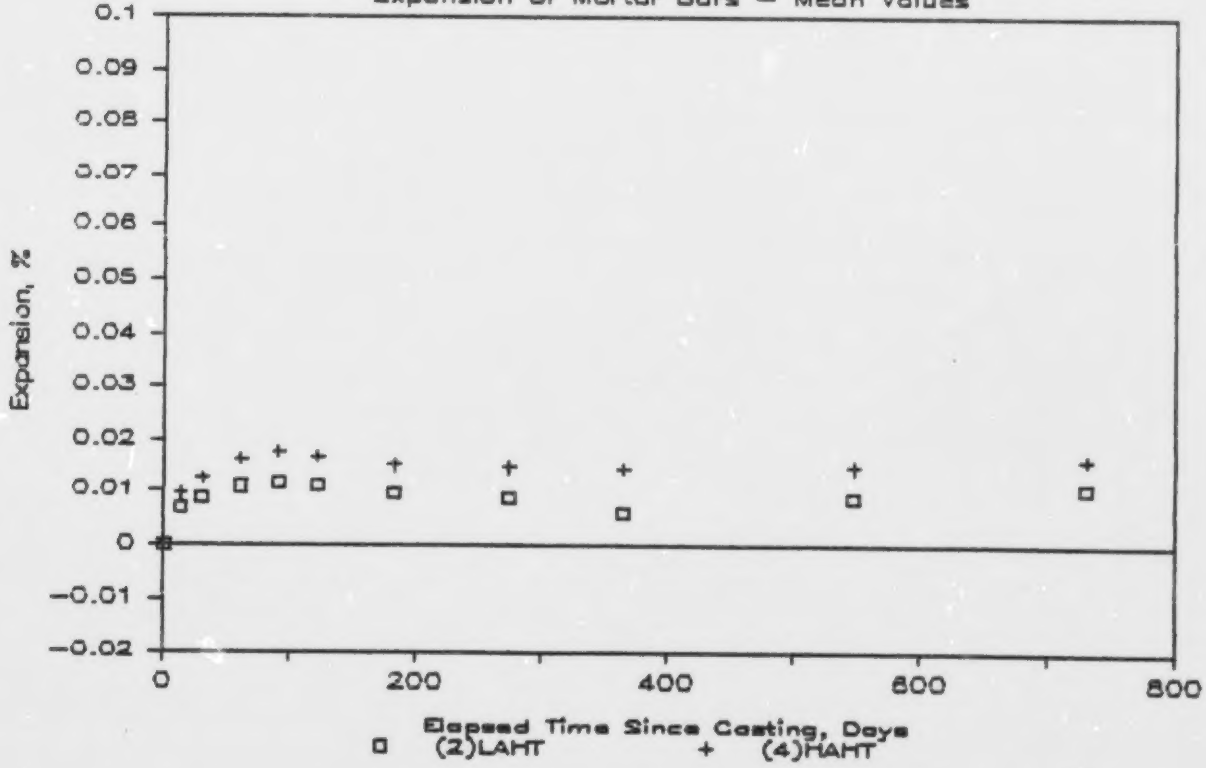
RS7–Meta–greywacke

Expansion of Mortar Bars — Mean Values



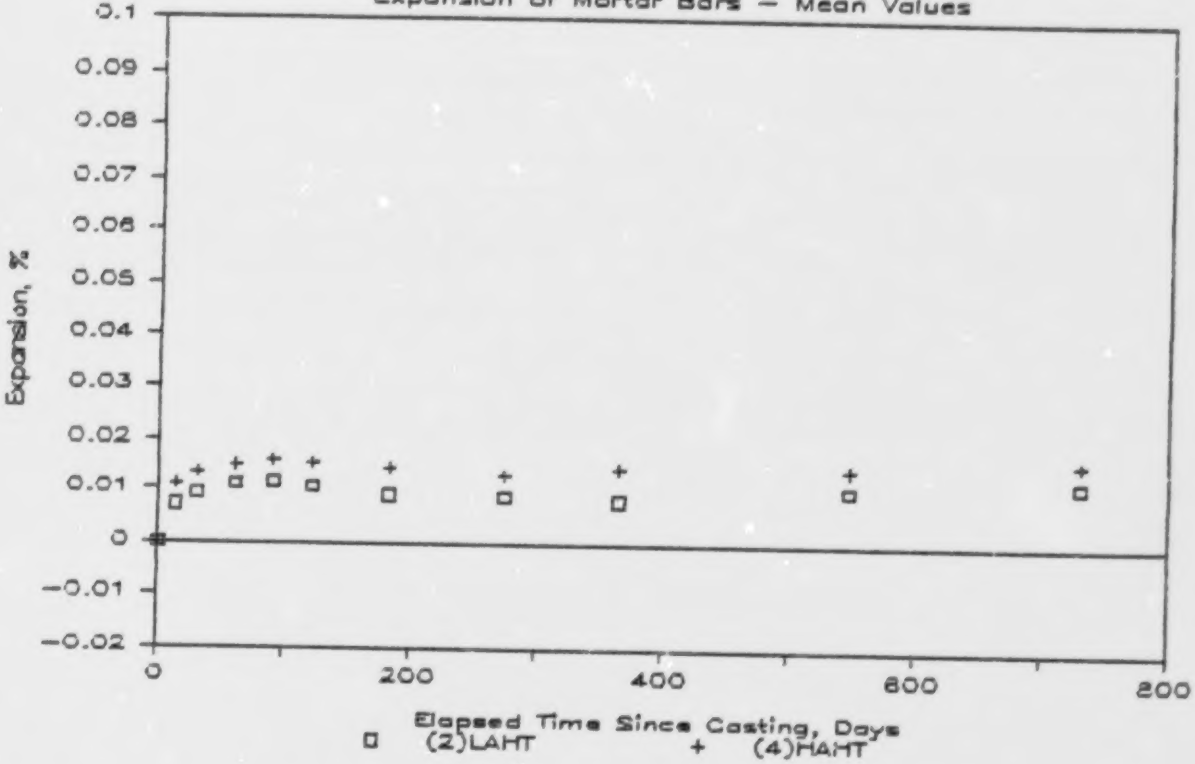
RS8–Greywacke

Expansion of Mortar Bars — Mean Values



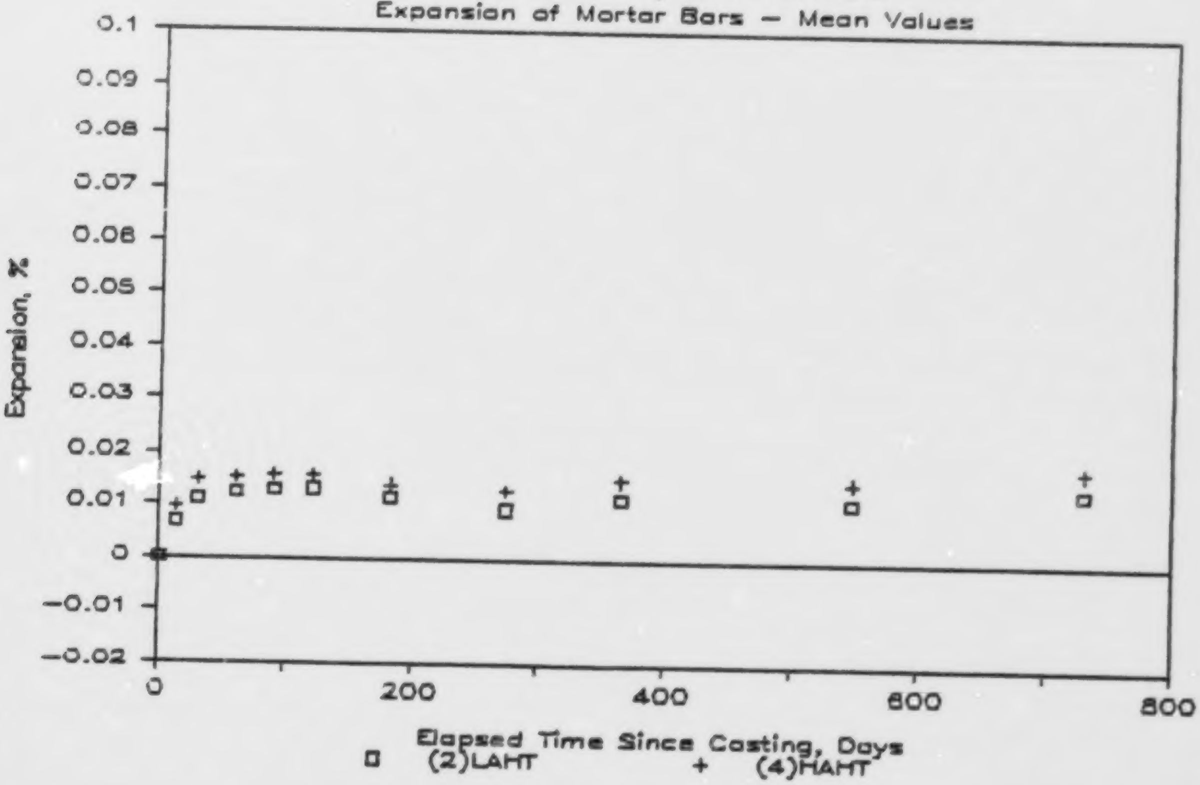
RS9-Greywacke

Expansion of Mortar Bars – Mean Values



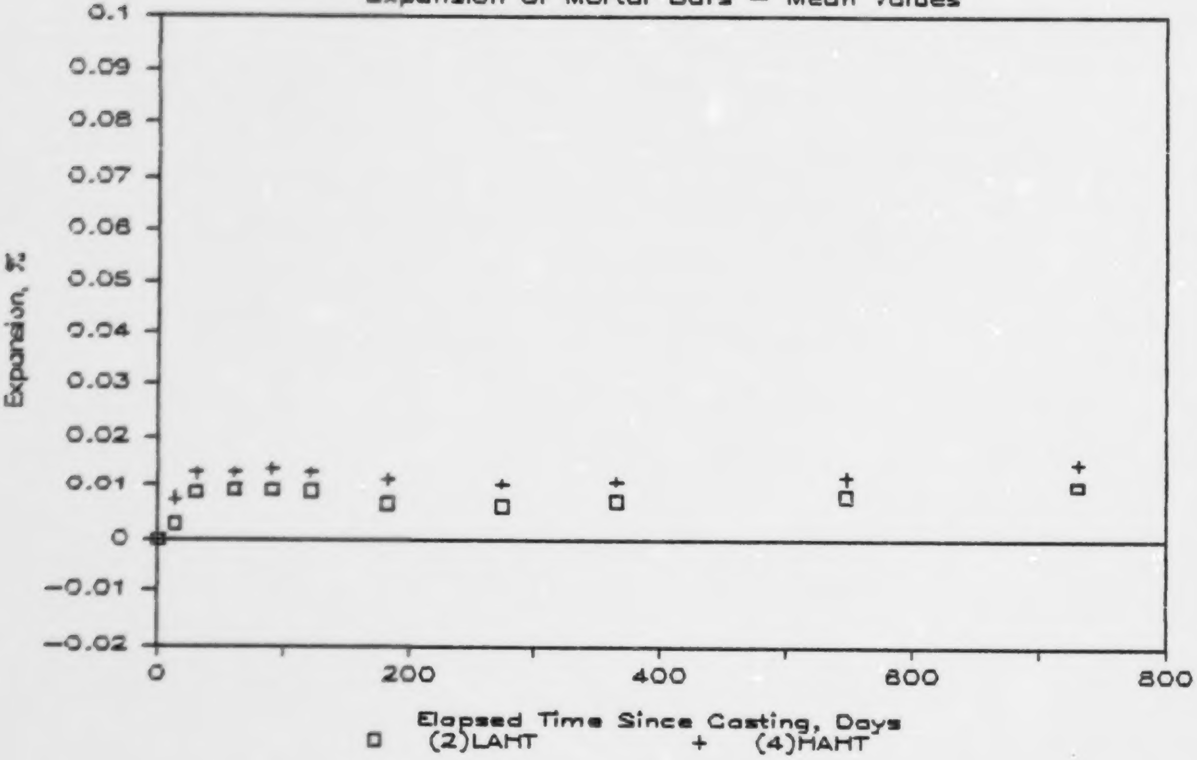
RS10-Quartzite

Expansion of Mortar Bars – Mean Values



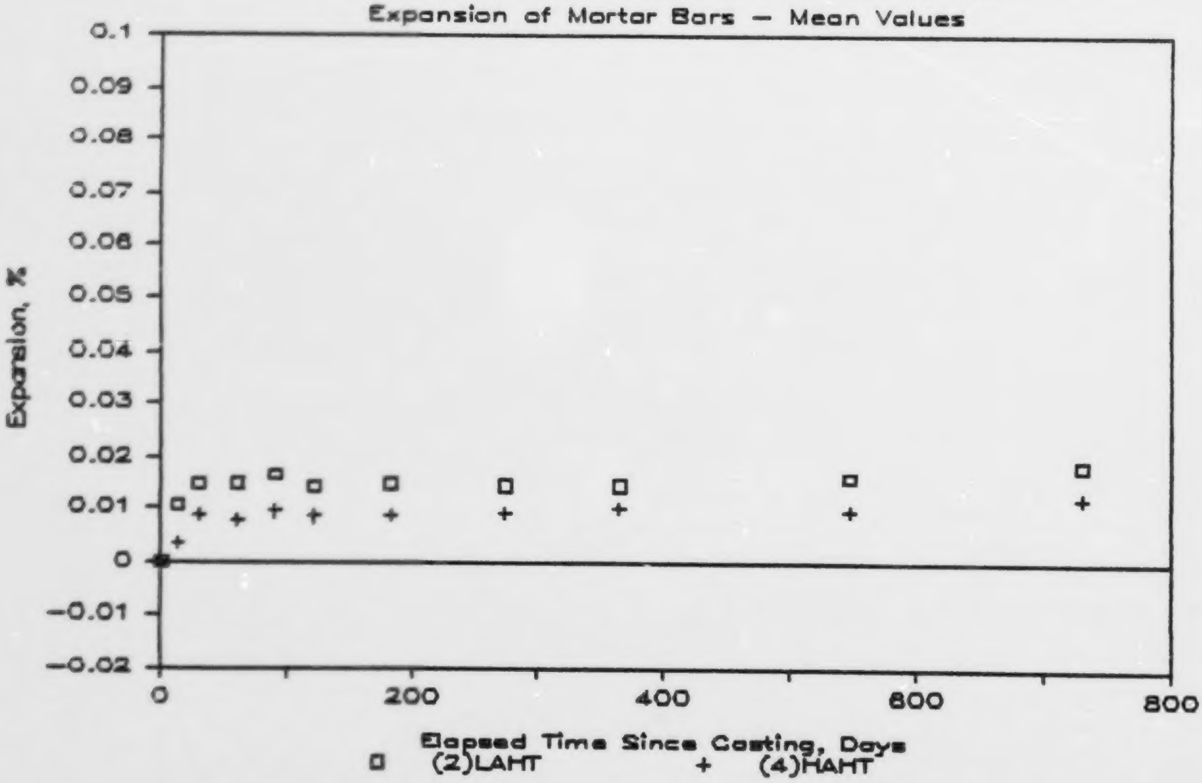
RS11-Quartzite

Expansion of Mortar Bars — Mean Values



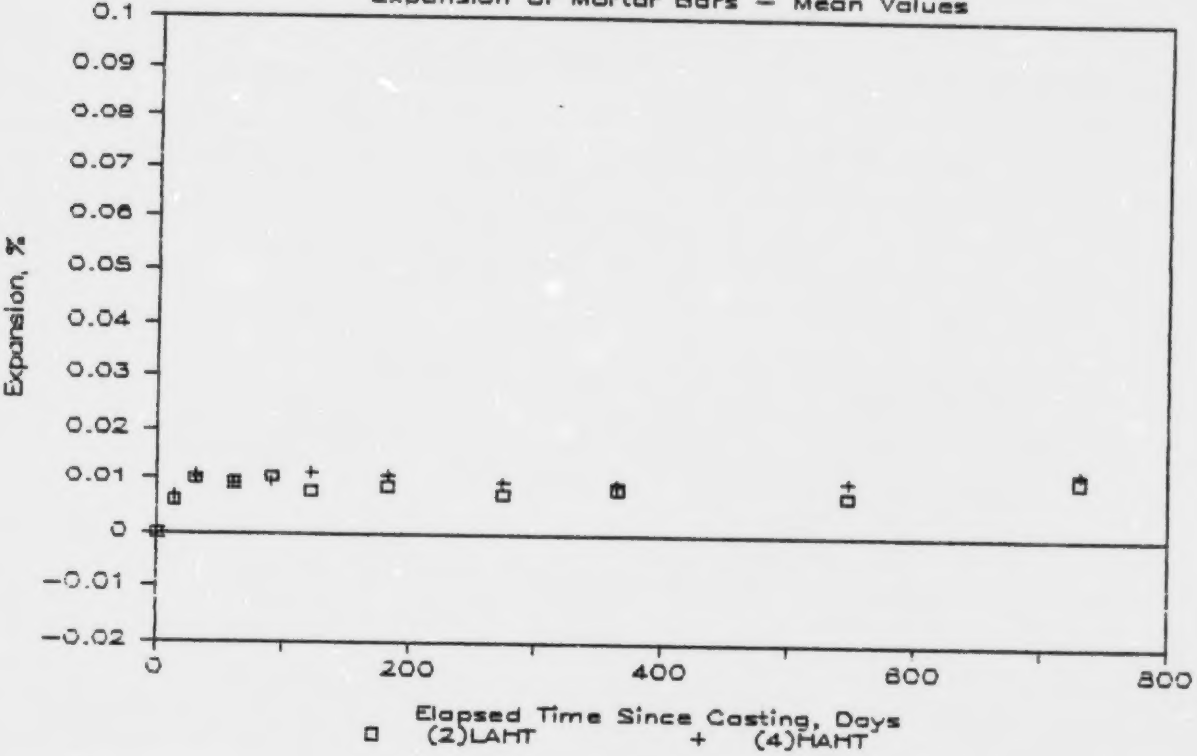
RS12-Silicified Volcanic

Expansion of Mortar Bars — Mean Values



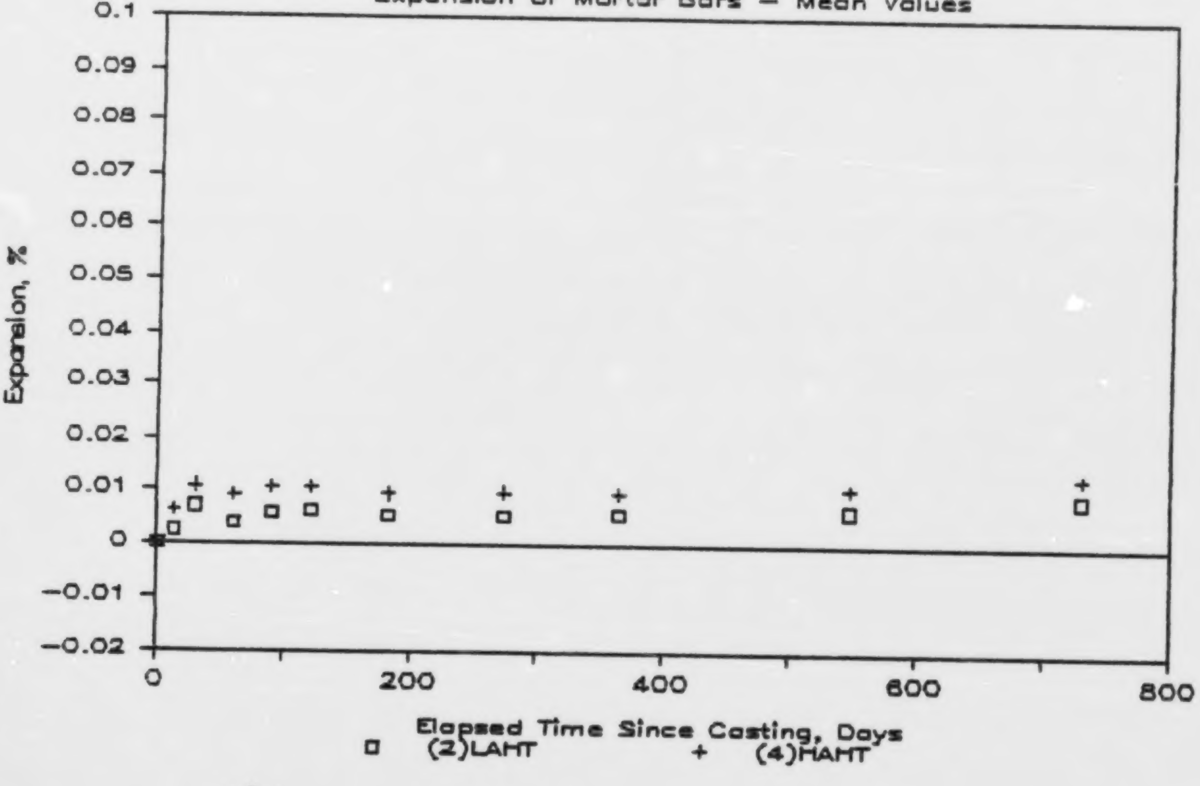
RS13–Microphyric Rhyolite

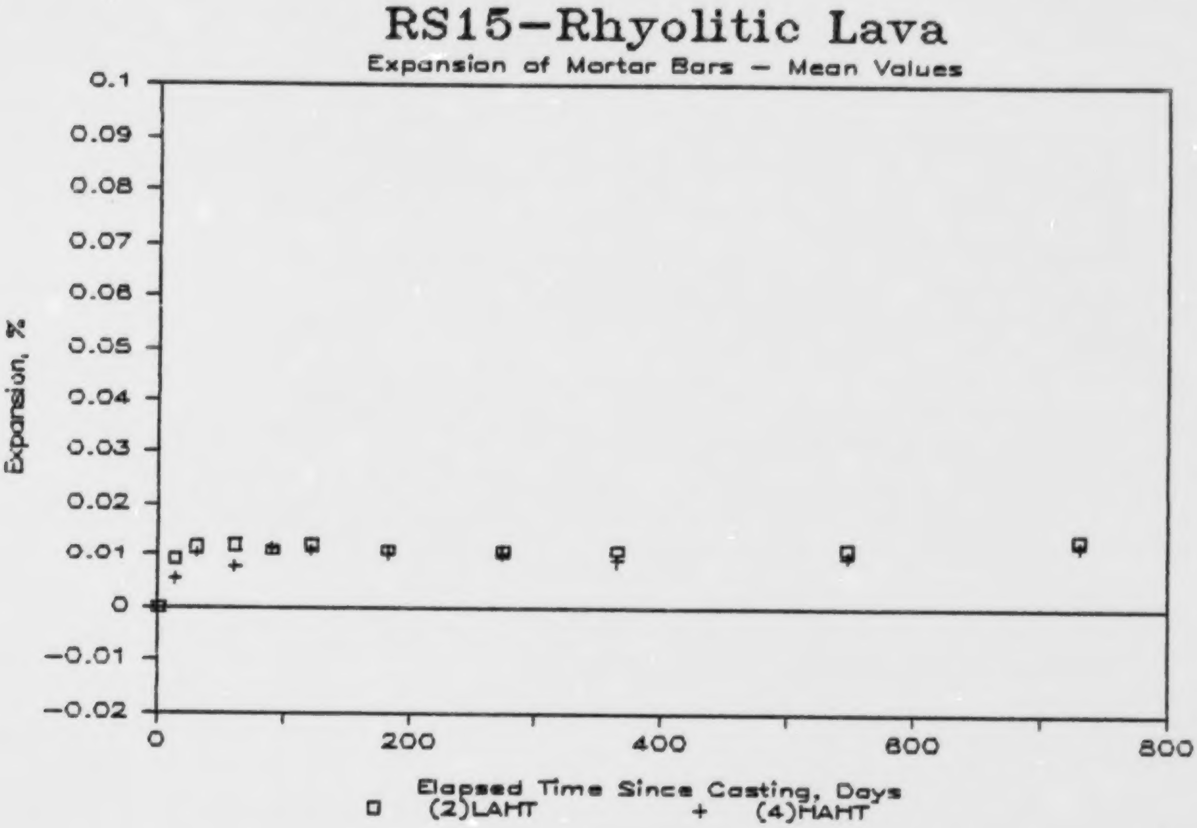
Expansion of Mortar Bars – Mean Values

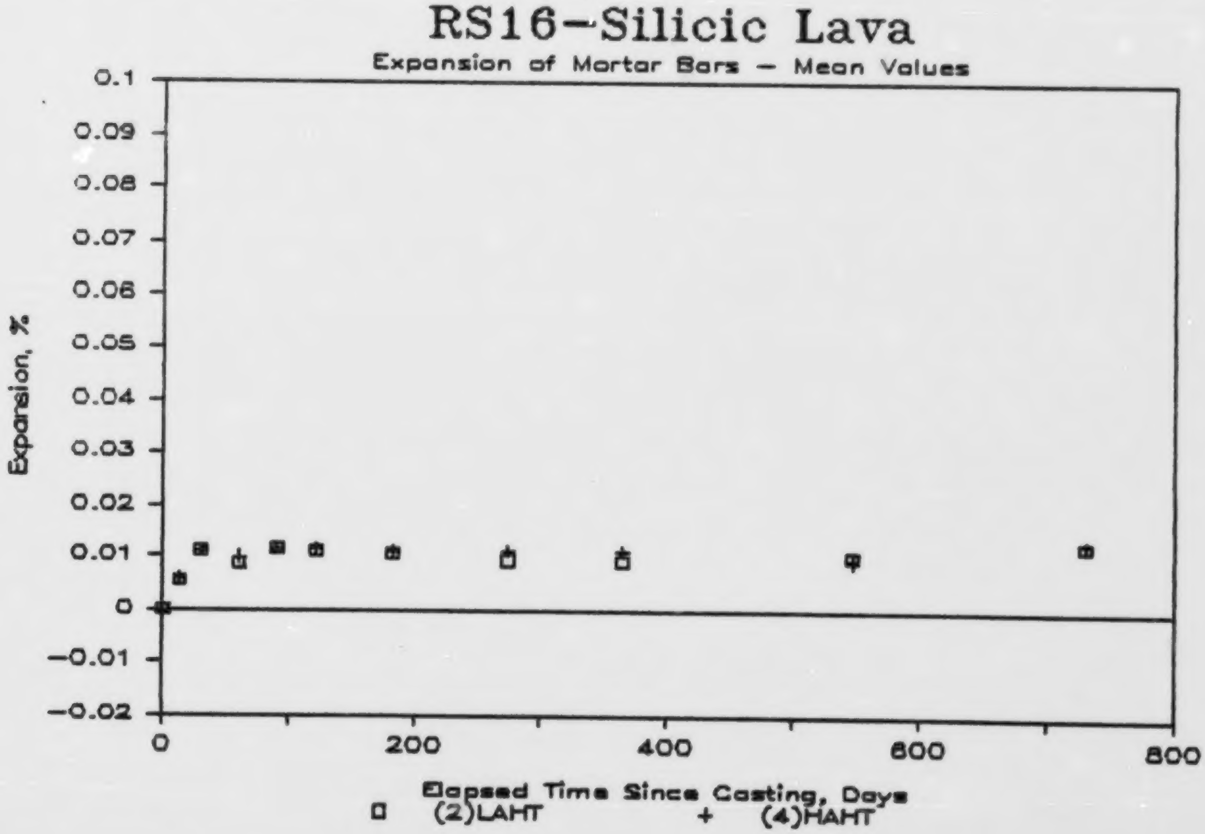


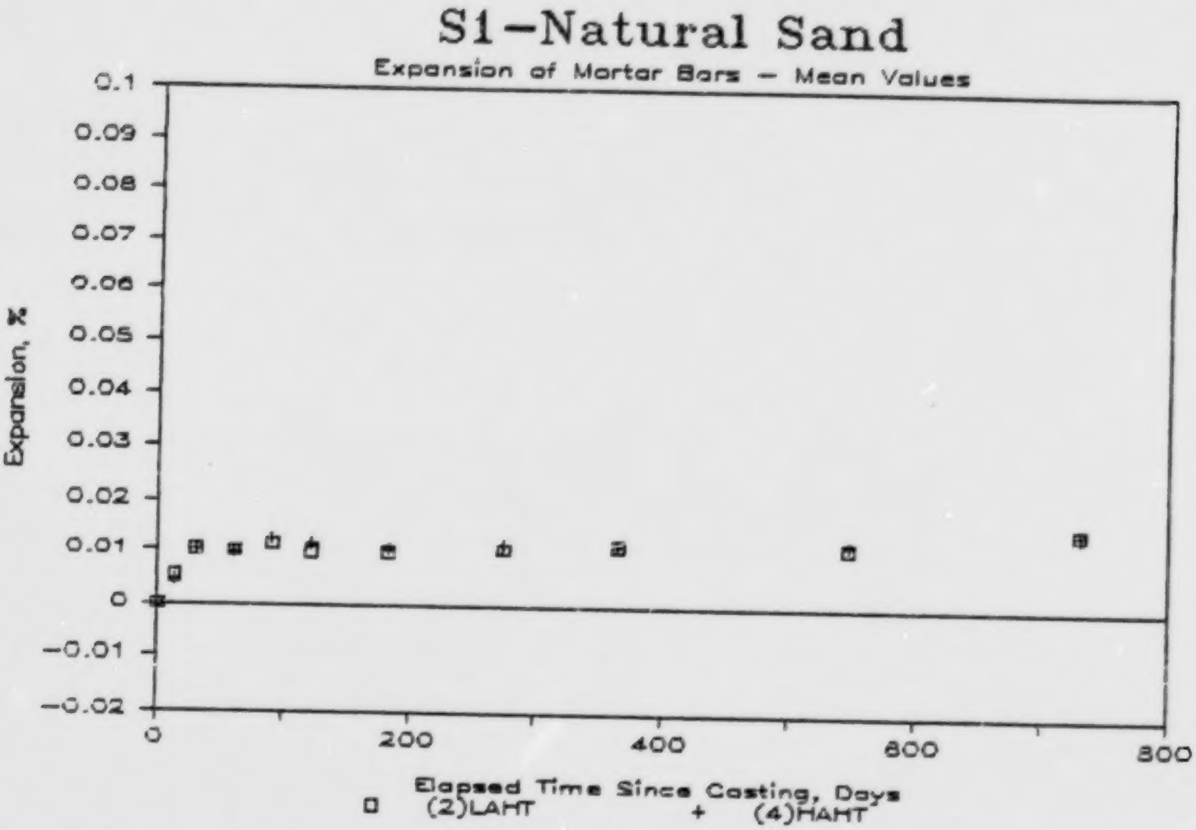
RS14–Rhyolitic Tuff

Expansion of Mortar Bars – Mean Values



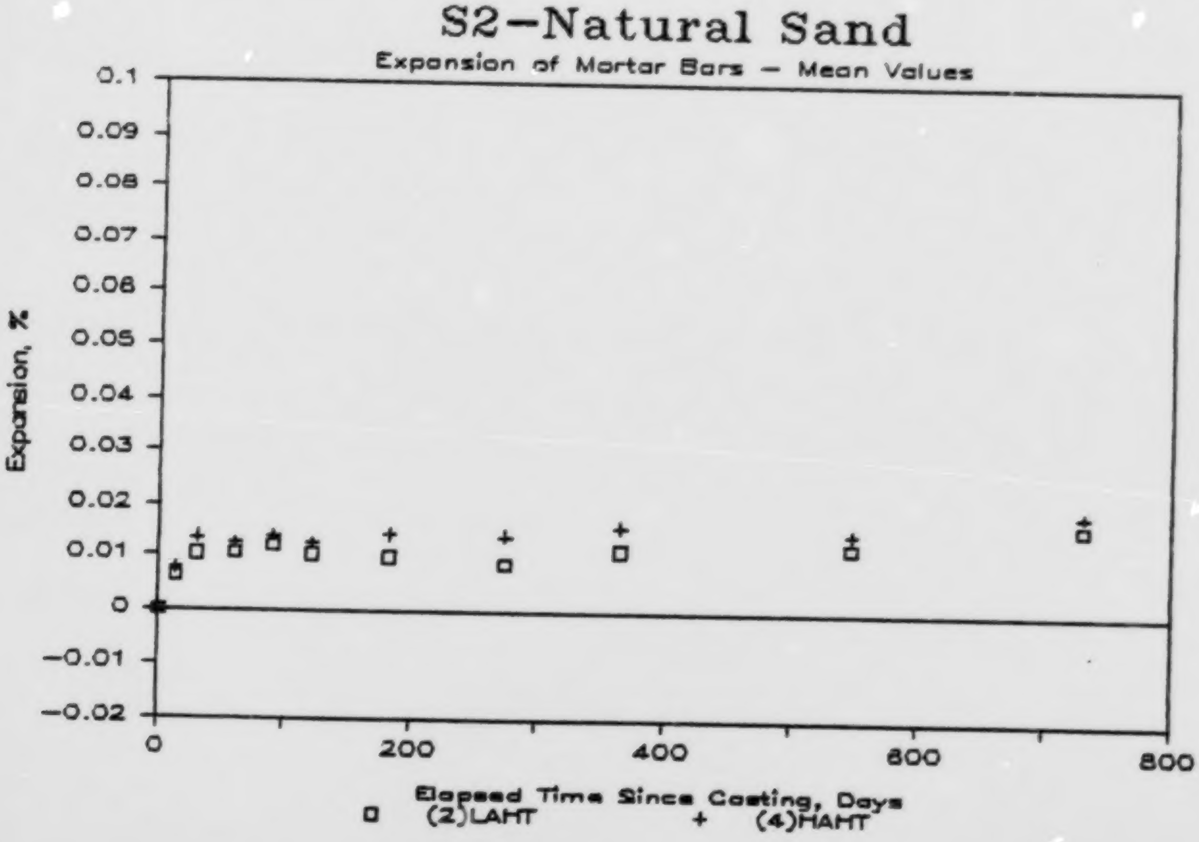

RS15–Rhyolitic Lava
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT


RS16–Silicic Lava
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT



S1–Natural Sand

Expansion of Mortar Bars – Mean Values

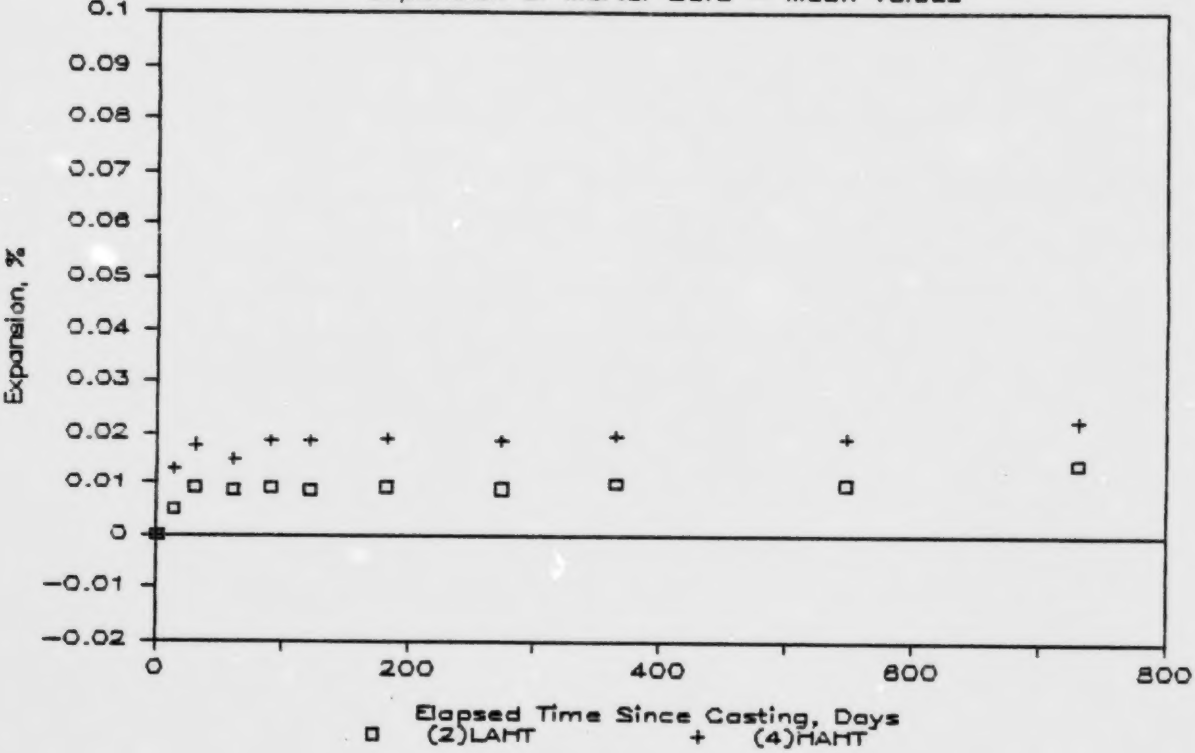


S2–Natural Sand

Expansion of Mortar Bars – Mean Values

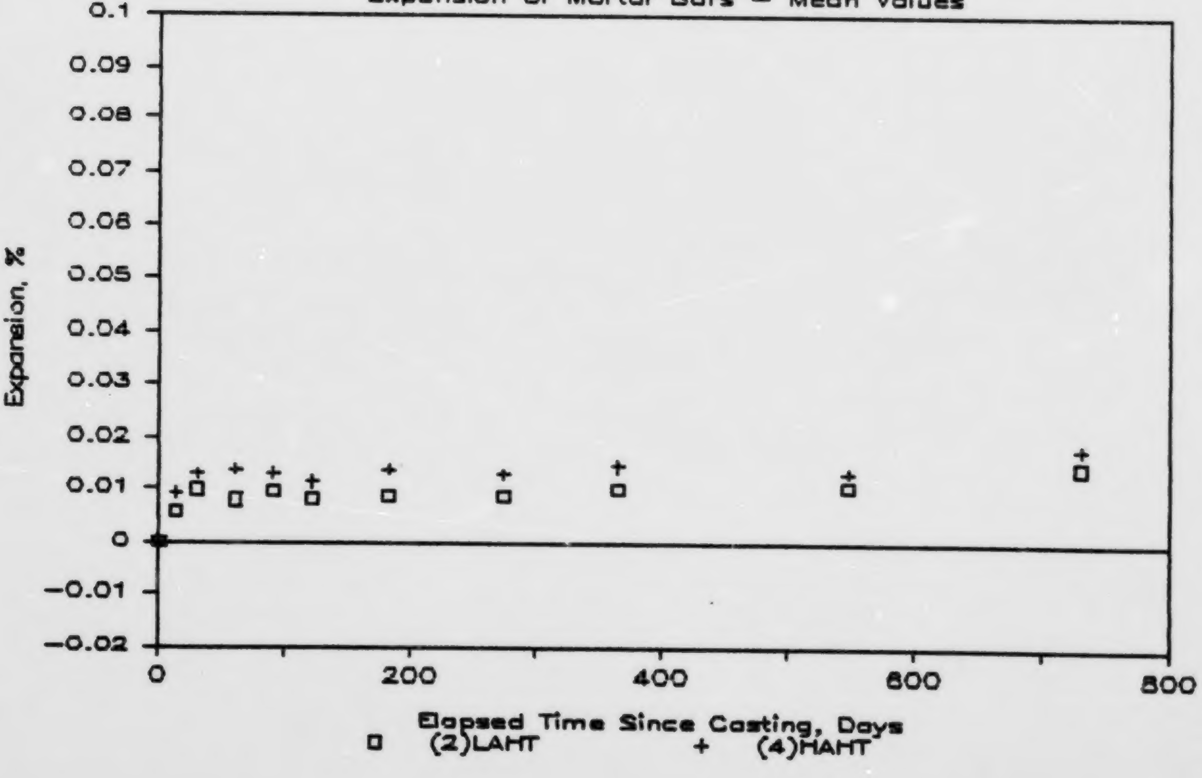
S3—Natural Sand

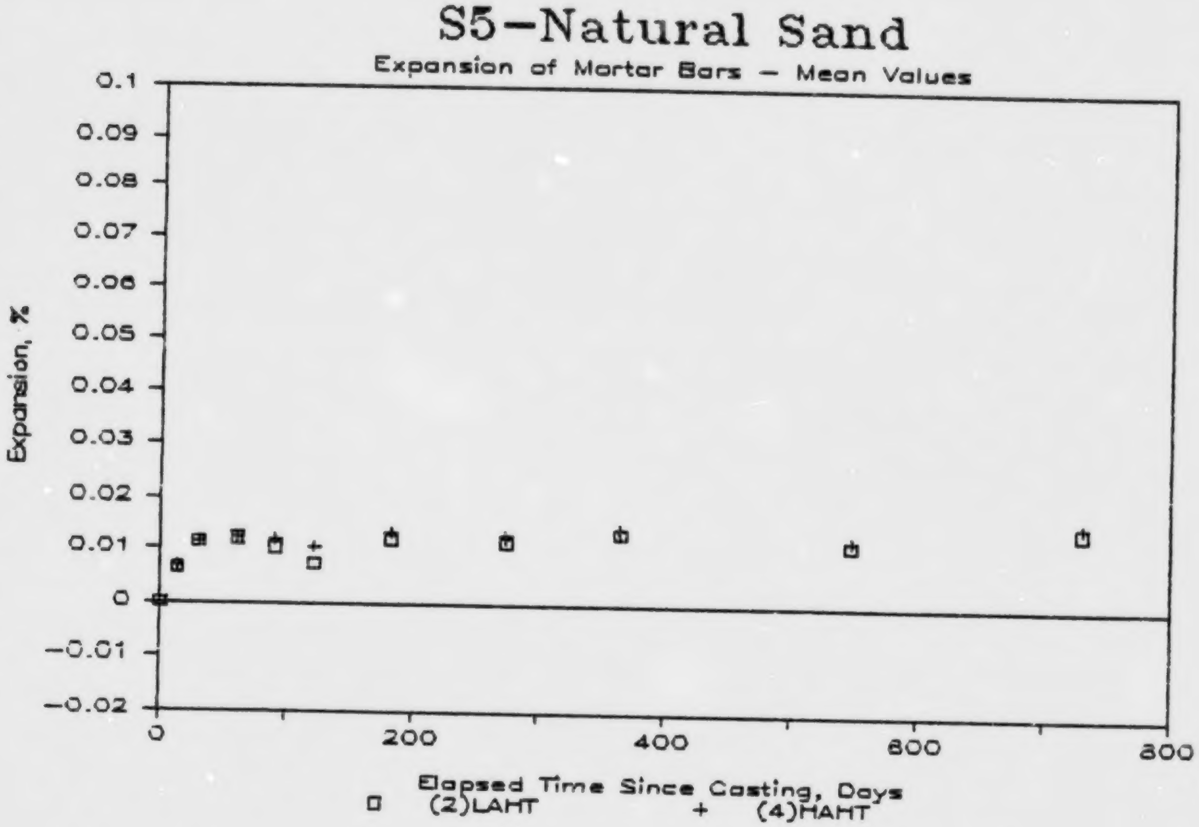
Expansion of Mortar Bars — Mean Values



S4—Natural Sand

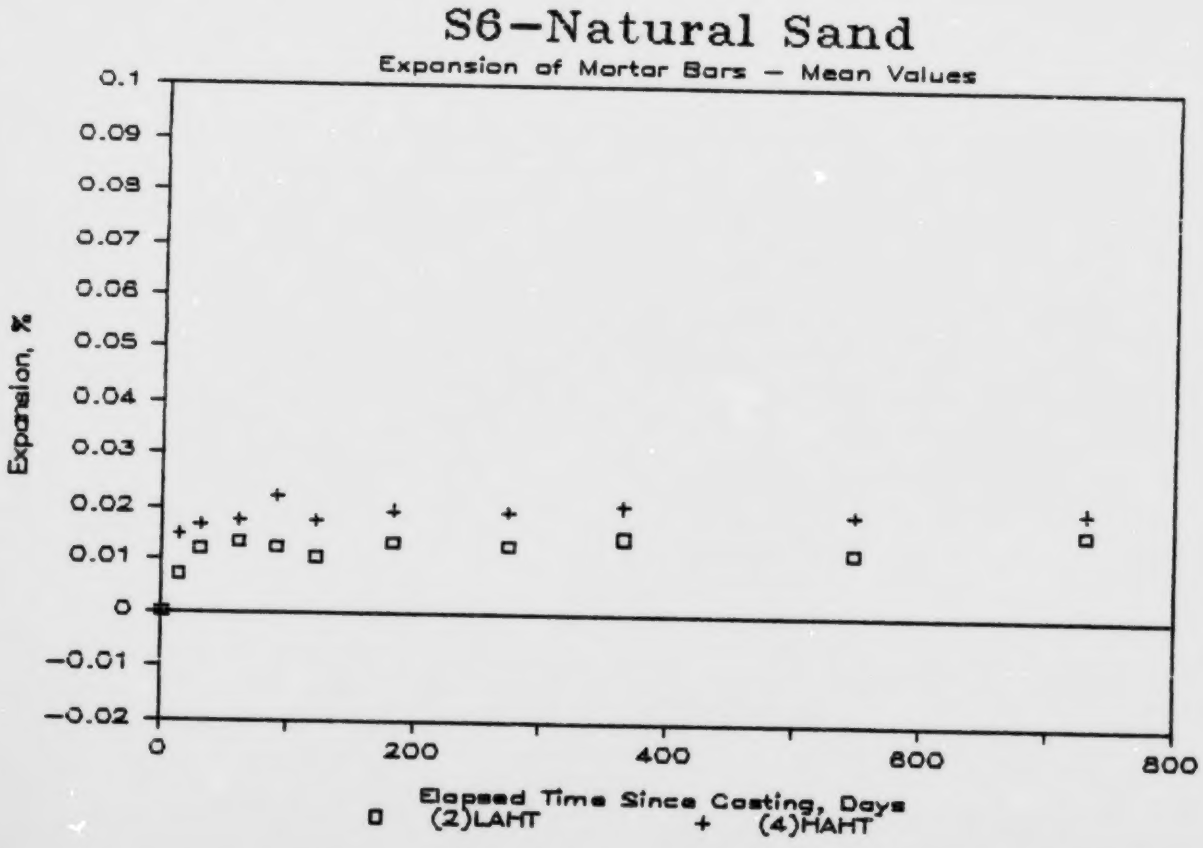
Expansion of Mortar Bars — Mean Values





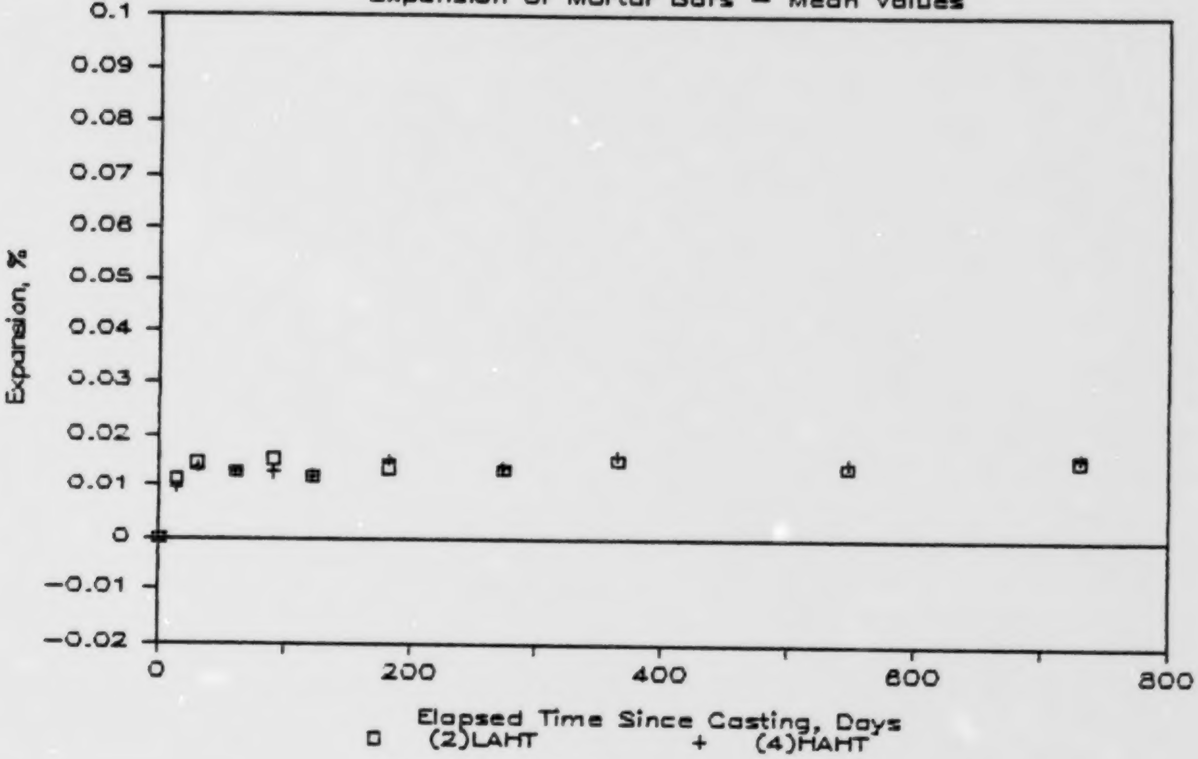
S5–Natural Sand

Expansion of Mortar Bars – Mean Values

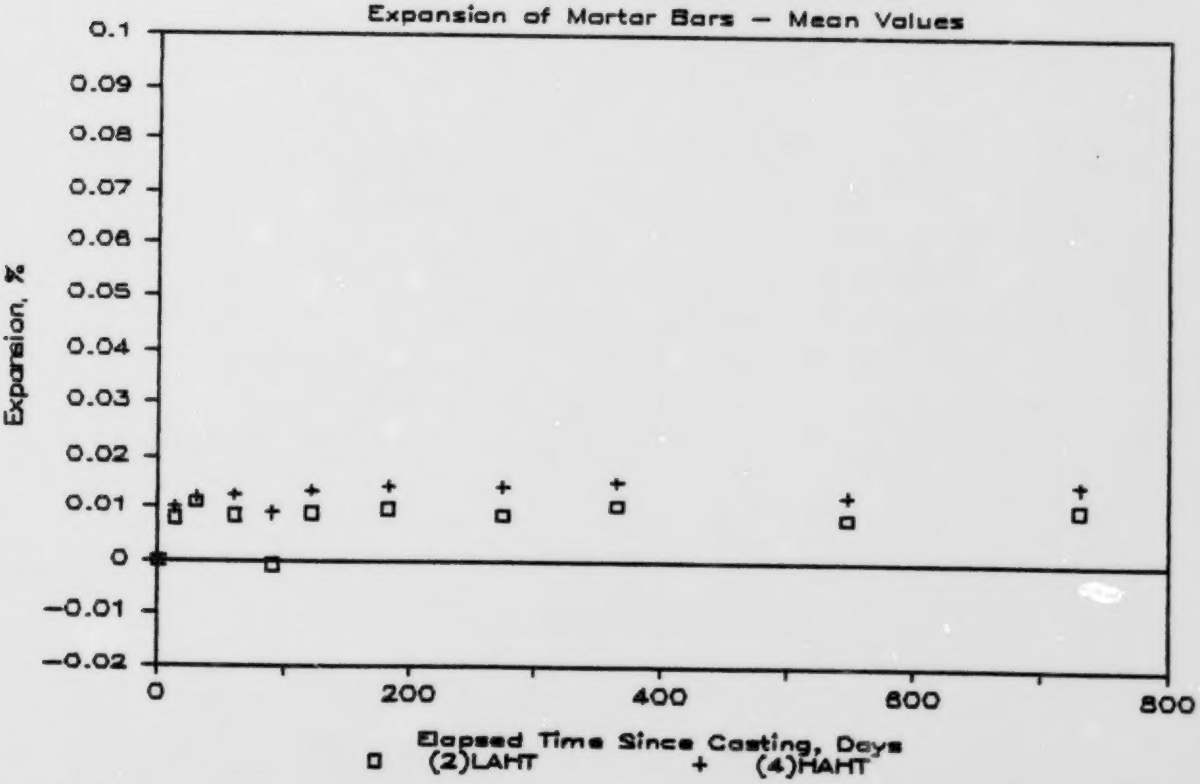


S6–Natural Sand

Expansion of Mortar Bars – Mean Values

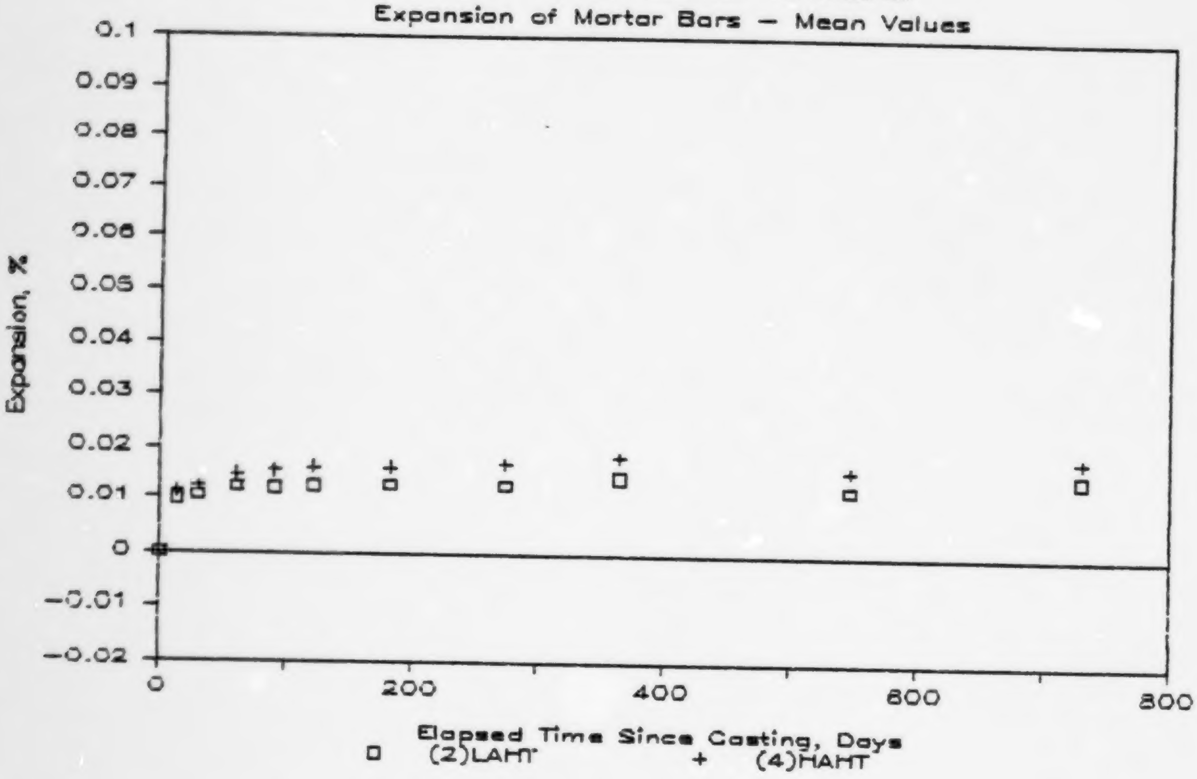

S7–Natural Sand

Expansion of Mortar Bars – Mean Values

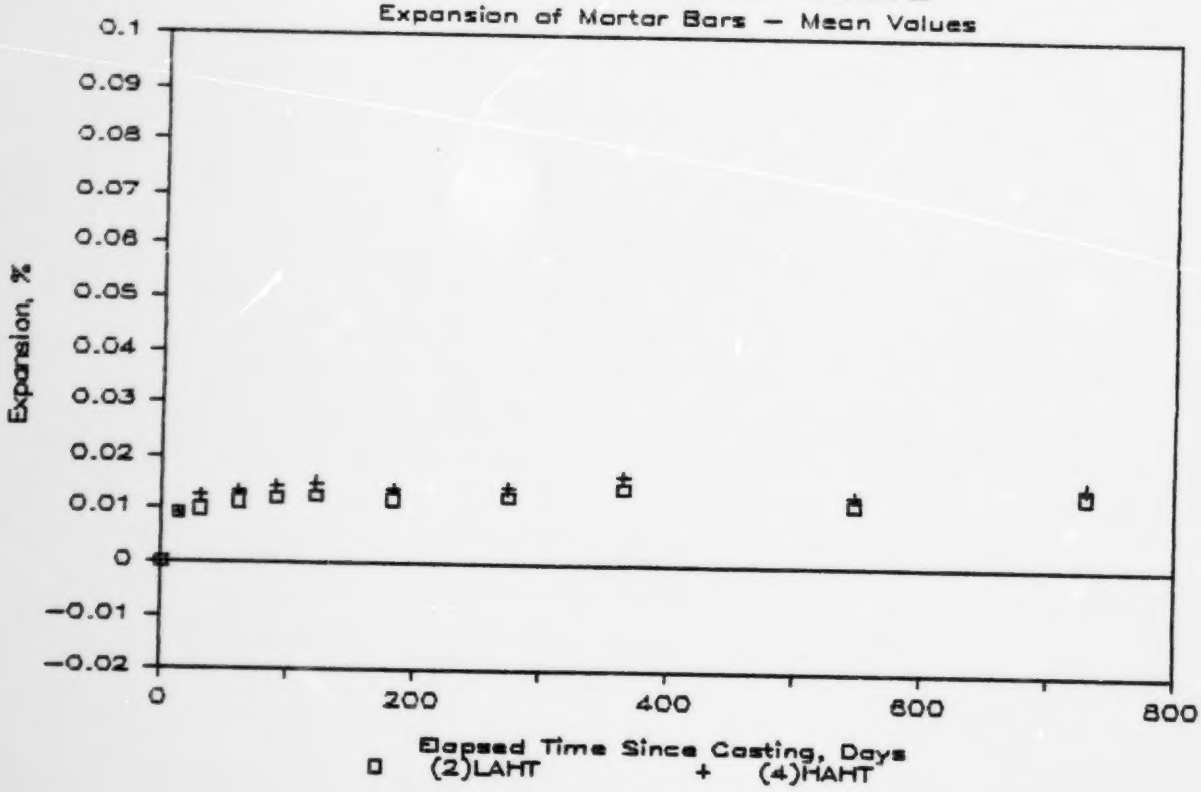

S8–Natural Sand

Expansion of Mortar Bars – Mean Values

S9–Natural Sand

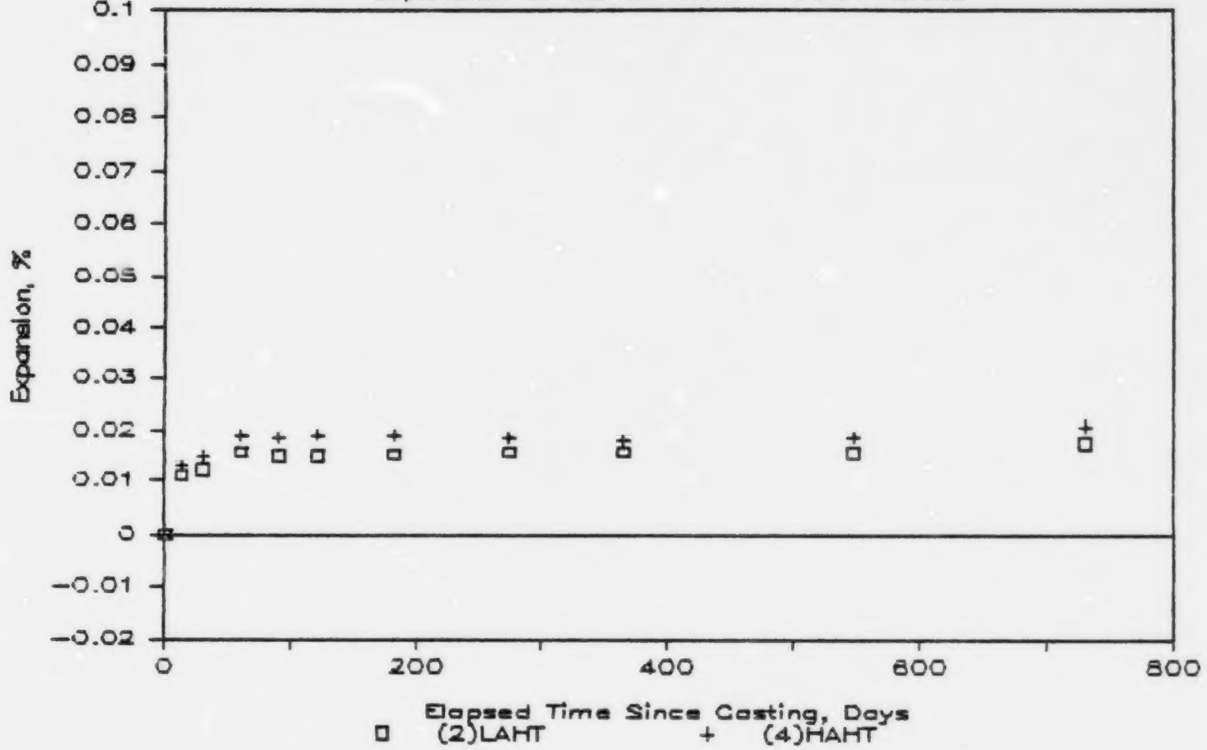


S10–Natural Sand



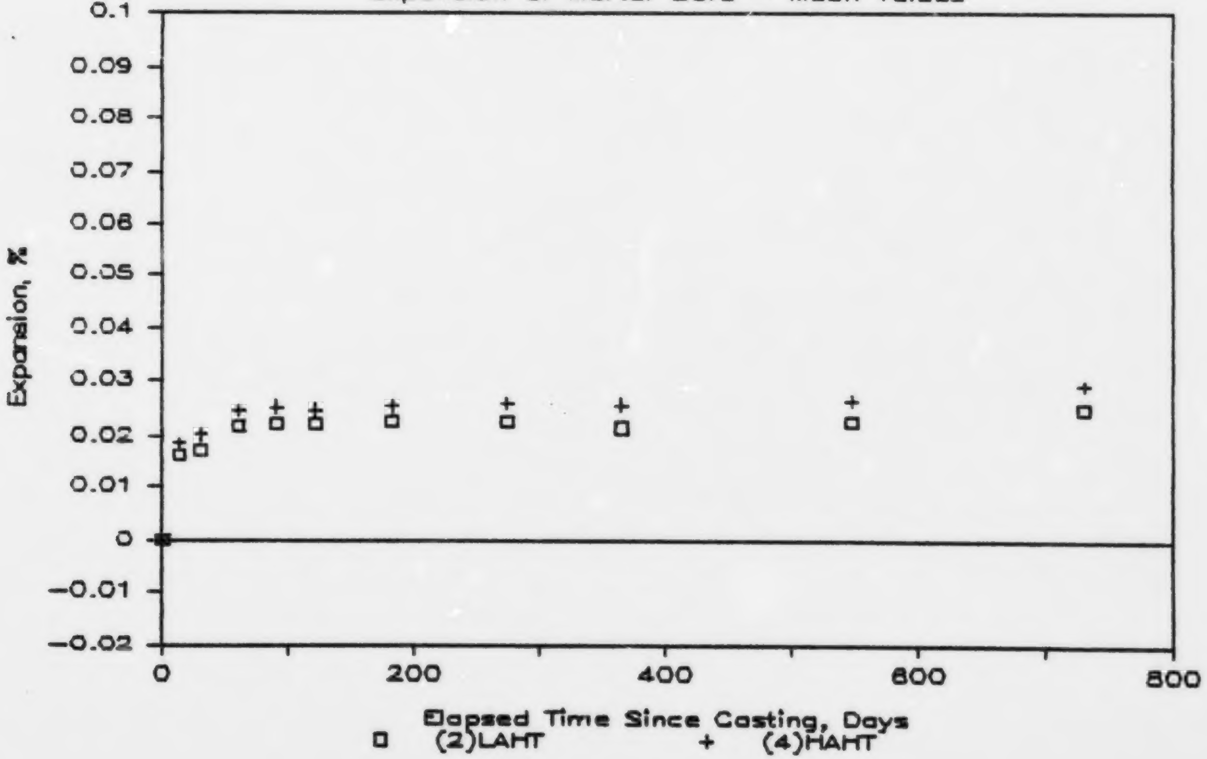
S11–Natural Sand

Expansion of Mortar Bars – Mean Values



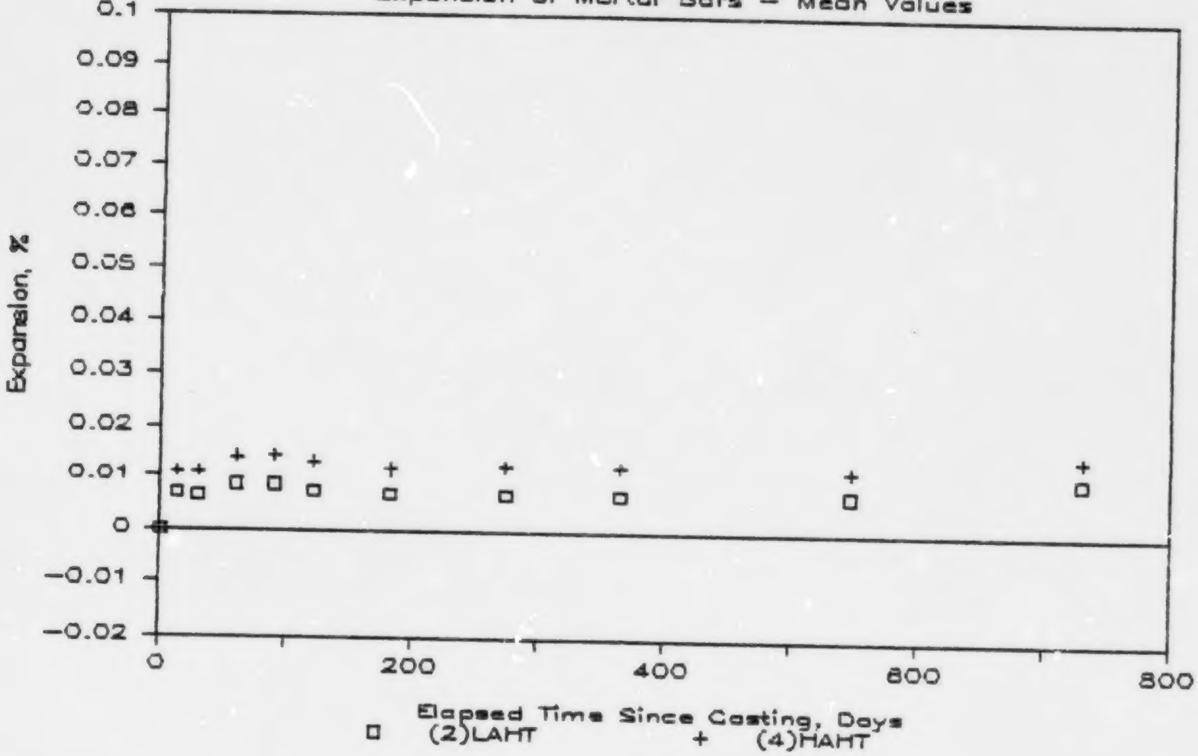
S12–Natural Sand

Expansion of Mortar Bars – Mean Values



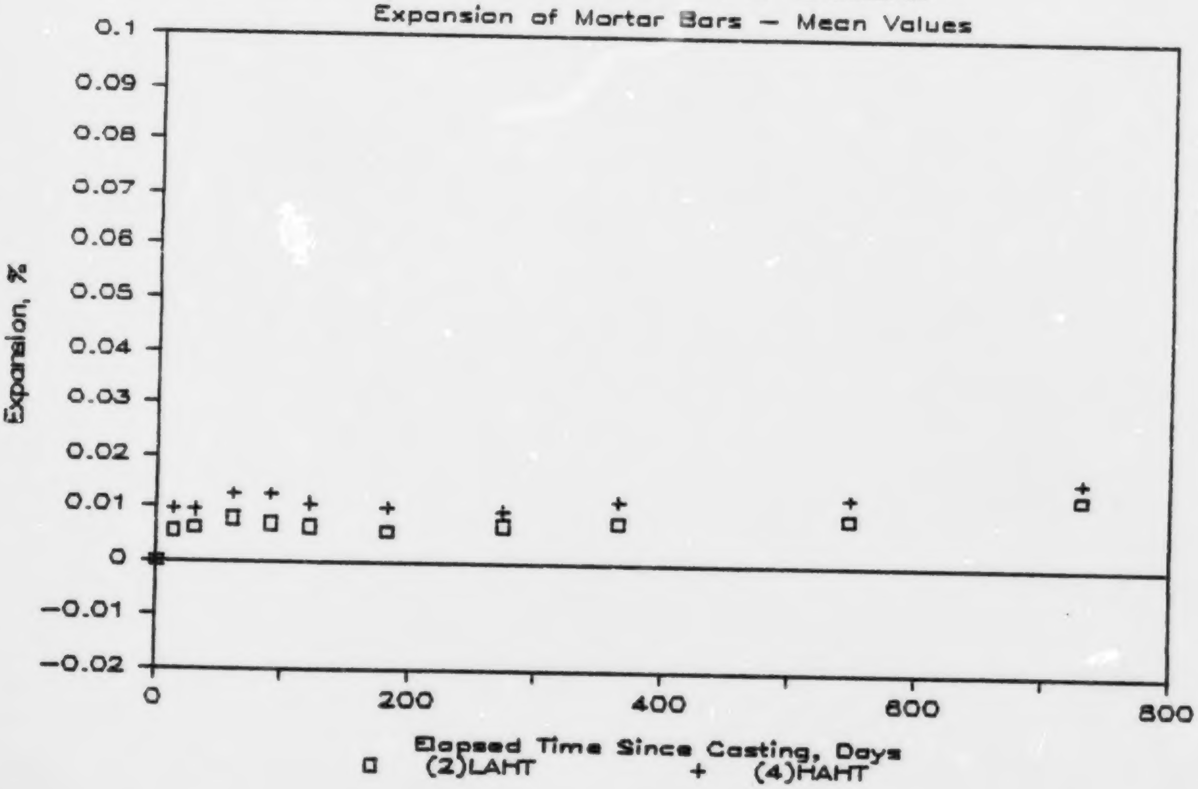
S13–Natural Sand

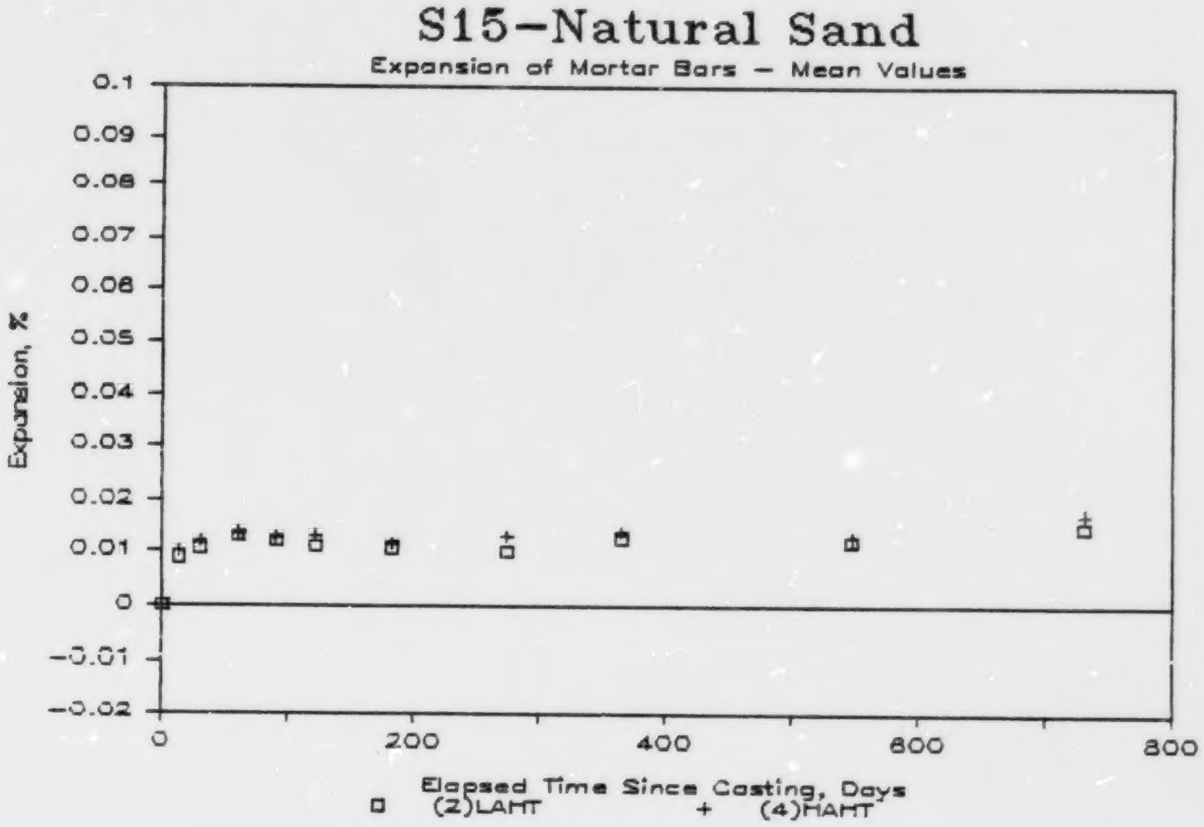
Expansion of Mortar Bars – Mean Values



S14–Natural Sand

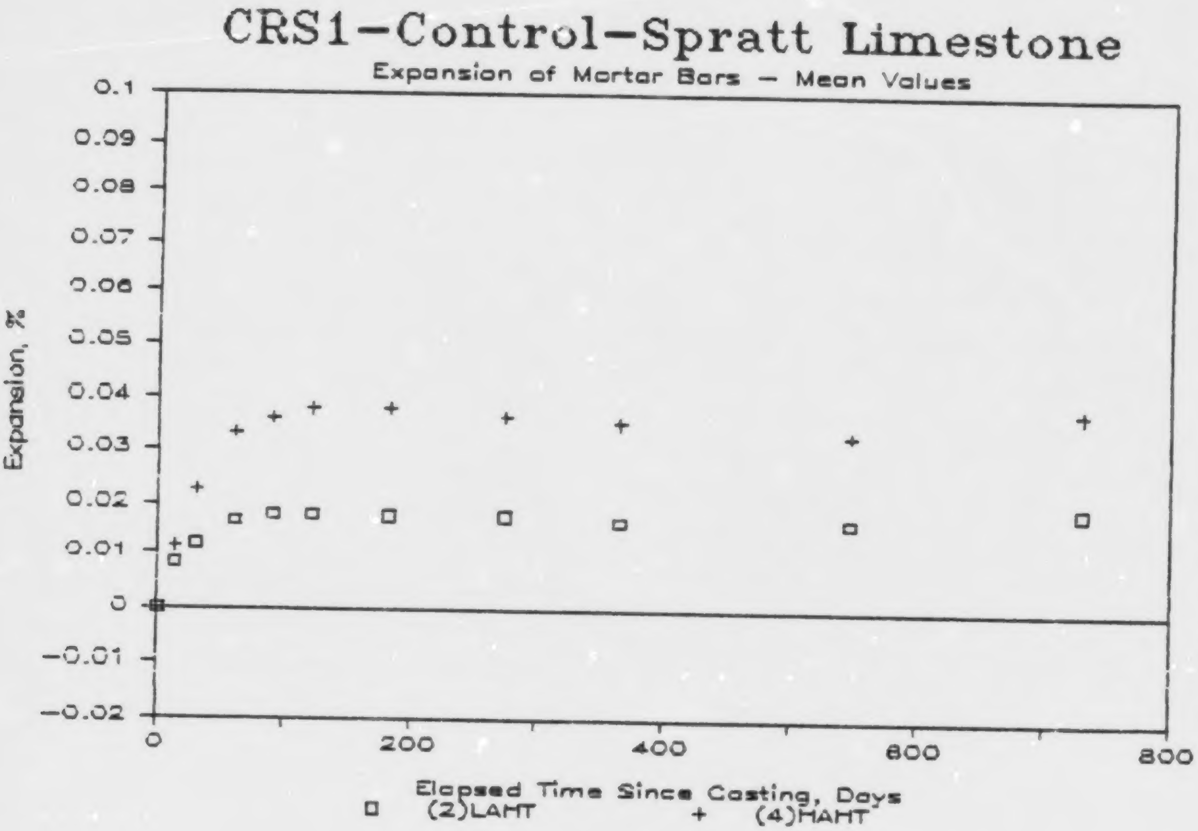
Expansion of Mortar Bars – Mean Values

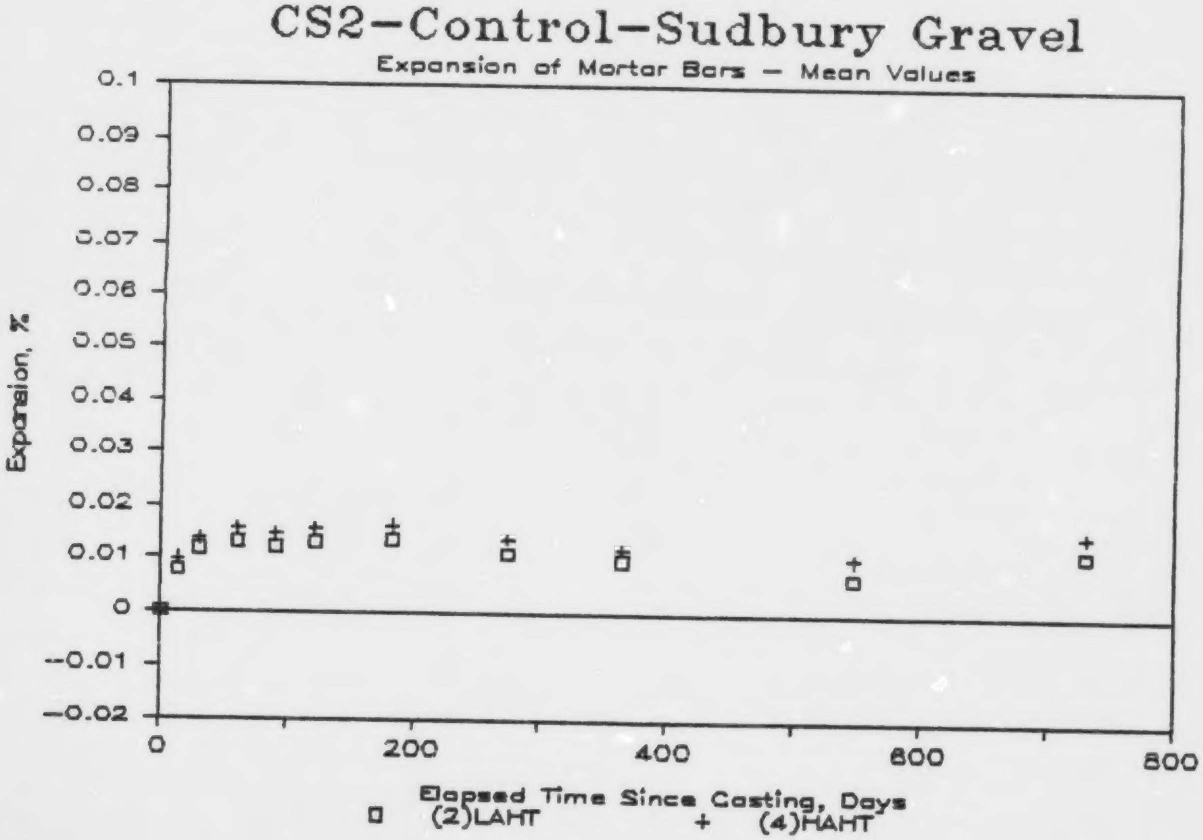




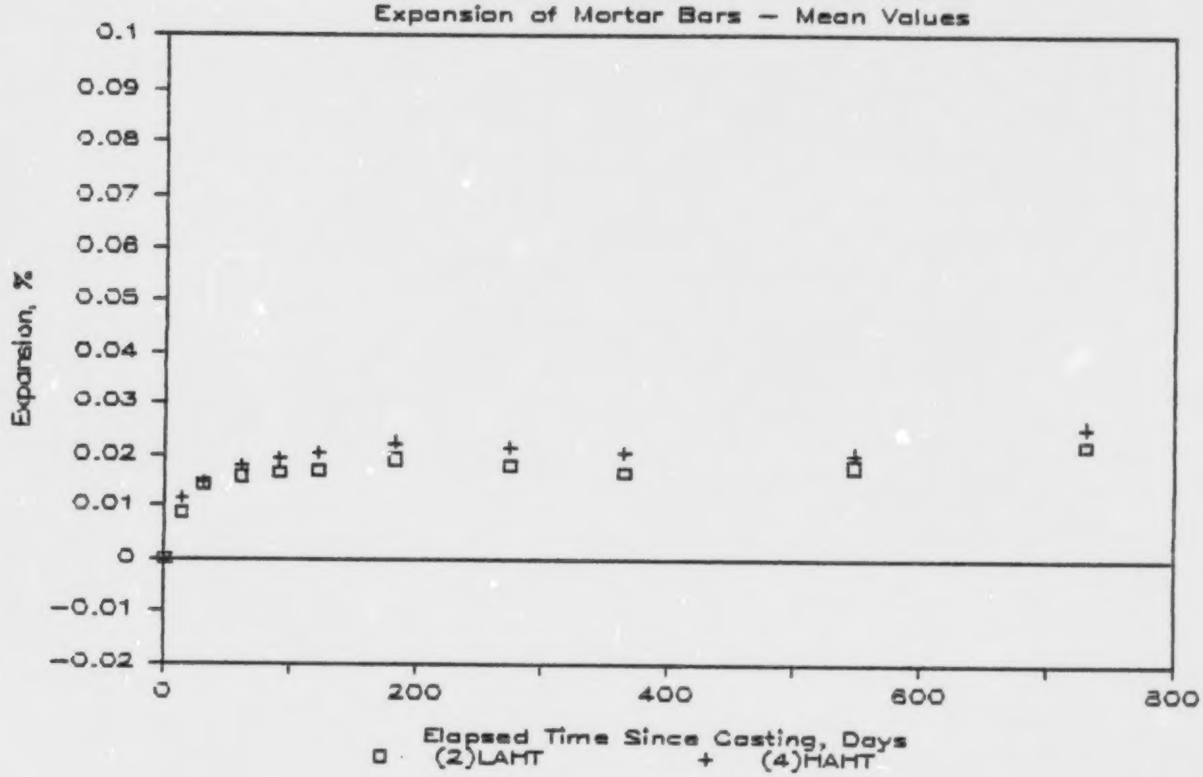
S15–Natural Sand

Expansion of Mortar Bars — Mean Values

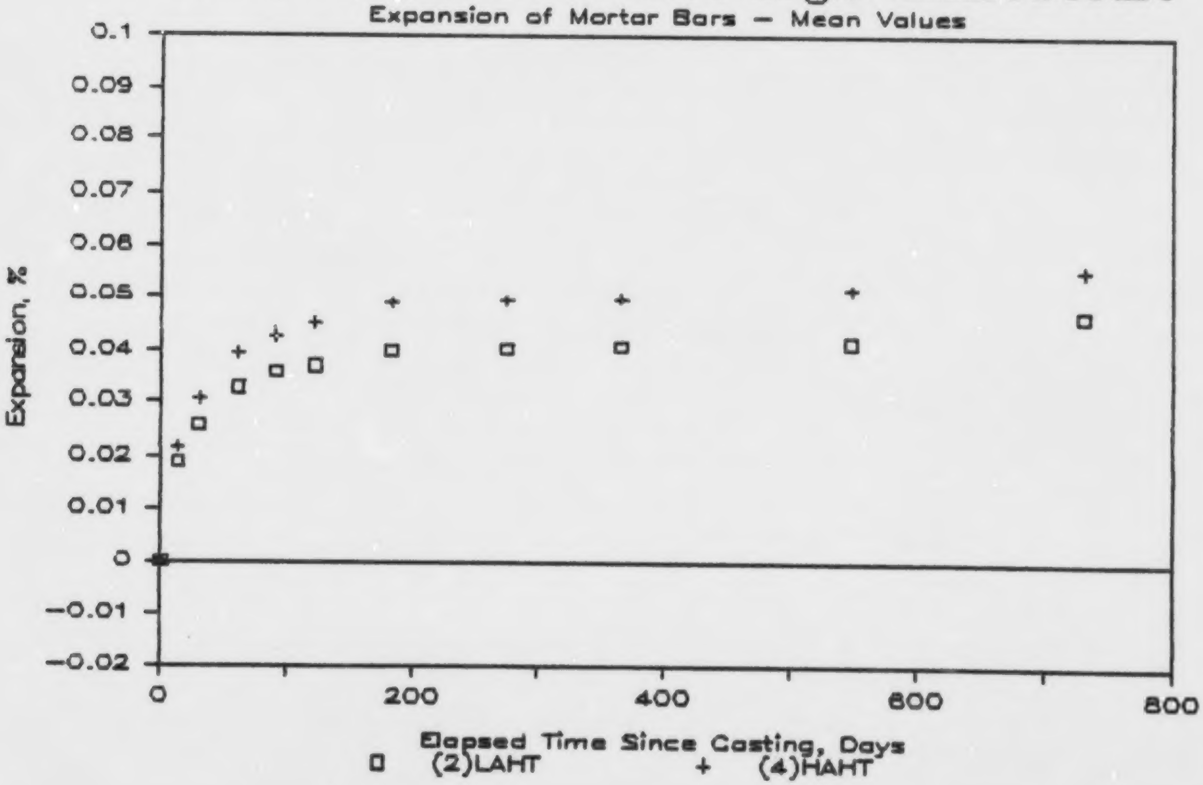

CRS1-Control-Spratt Limestone
Expansion of Mortar Bars — Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

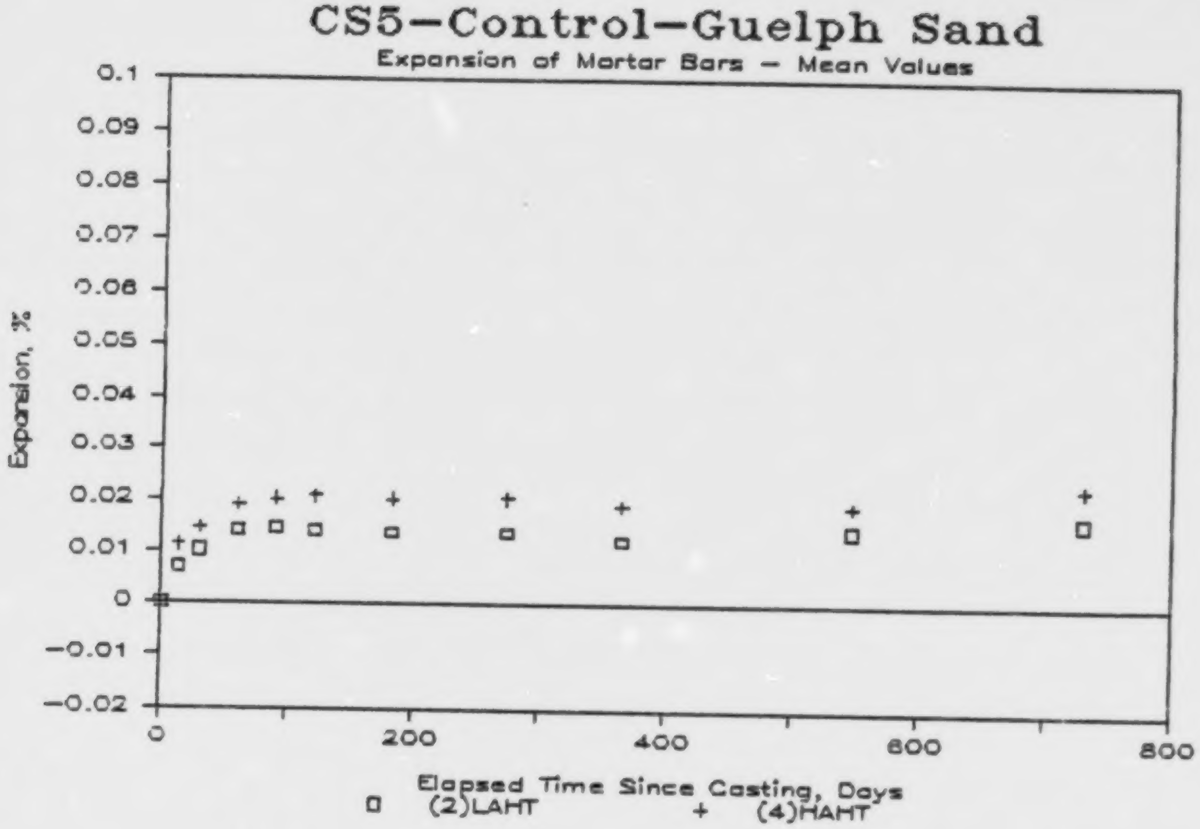

CS2-Control-Sudbury Gravel
Expansion of Mortar Bars — Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
-0.01
-0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

CRS3–Control–Nelson



CRS4–Control–Pittsburgh Limestone




CS5–Control–Guelph Sand
Expansion of Mortar Bars – Mean Values
Expansion, %
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
–0.01
–0.02
0
200
400
600
800
Elapsed Time Since Casting, Days
□ (2)LAHT
+ (4)HAHT

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STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
OF NEW BRUNSWICK

APPENDIX A

RECORD OF SITE VISITS
(Bound Under Separate Cover)

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Owner I.D. No.

M47
CNR adjacent to M-47
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S46
Old CNR adjacent to S-46
E22
L84
E-22A
CPR at Woodstock
J04
H16
CPR at Becaquimec River
B20
H90
F50
CPR at Bristol
CPR at Shikatehawk River
S35
S34
M66
M06
H26
Edmundston International
T94
M10
M12
CNR Madawaska River 1953
Cyr Junction
C74A
M53
M49
B43
E15
H28
C40
CNR adjacent to C40
CNR Overpass Campbellton
R21
W06
E21

Owner I.D. No.

H96
Tobique Dam
A60
DOT15
Old Aroostook River
CPR at Aroostook
F70
A85
R09
Grand Falls Hydro Plant
L44
Abandoned Pier, Grand Falls
G85
G52
S44
C86
CNR at Green River 208-5
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CNR at Madawaska River 219
CNR adjacent to 219
Fraser Hydro Plant
M08
T04
B33
L40
C30
J75
N54
CNR Overpass 1916
S67
CNR adjacent S67
R18
D70
CNR 45-7
W46
R48
R48A
P90
J25
Old Jemseg Bridge

Owner I.D. No.

Eel River Dam
S64
L68
B35
N05
J07
T35
P33
T28
S70
B32
L58
CNR adjacent to L58
CNR overpass 1909
N30
CNR adjacent B05
T20
S55
B37
L68
CPR Nashwaaksis
K44
C10
F64
C68
R22
N16A
CPR Nashwaak River
Marysville Dam
CNR Fredericton 1937
B42
F50
N49
H70
G68
M03
B51
A60
P25
P37
B14
K58
H96
K62
C39
C72
M61
C71
C90
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F20

Owner I.D. No.

Jemseg Wharf
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D52
P57
T74
P17
P15
West Musquash Dam
East Musquash Dam
Port of Saint John
B90
B60
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CNR adjacent N26
N31
N24
T18
D82
G04
L84
M90
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N26
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B82
St. George Dam
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D32A
Milltown Dam
C72
D66
S55
L82
S88
U72
D14
D16
Y77
M16
G16
Mactaquac Dam
Beechwood Dam
H72
G08
H50
C28
M68
G22
P12

STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
OF NEW BRUNSWICK

APPENDIX B

RECORD OF STRUCTURES SAMPLED
(Bound Under Separate Cover)

DWG. B1 - LOCATION PLAN OF STRUCTURES SAMPLED

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DOT 5	E-22A	5
DOT 6	S-46	6
DOT 7	M-12	7
DOT 8	R-09	8
DOT 9	H-26	9
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DOT 11	N-24	11
DOT 12	N-16A	12
DOT 13 & 14	R-48 & R-48A	13
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DOT 16	B-33	15
DOT 17	Y-77	16
DOT 18	M-16	17
DOT 19	B-90	18
DOT 20	B-60	19
DOT 21	H-28	20
DOT 22	B-43	21
DOT 23	T-20	22
DOT 24	B-35	23
DOT 25	L-68	24
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DOT 40	G-08	39
DOT 41	K-38	40
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STUDY OF THE ALKALI-REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX C

RECORD OF CONCRETE SAMPLED
(Bound Under Separate Cover)

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DOT 4	D-52
DOT 5	E-22A
DOT 6	S-46
DOT 7	M-12
DOT 8	R-09
DOT 9	H-26
DOT 10	P-57
DOT 11	N-24
DOT 12	N-16A
DOT 13	R-48
DOT 14	R-48A
DOT 15	--
DOT 16	B-33
DOT 17	Y-77
DOT 18	M-16
DOT 19	B-90
DOT 20	B-60
DOT 21	H-28
DOT 22	B-43
DOT 23	T-20
DOT 24	B-35
DOT 25	L-68
DOT 26	C-40
DOT 27	W-26
DOT 28	F-20
DOT 29	L-84
DOT 30	H-27
DOT 31	N-26
DOT 32	N-26A
DOT 33	R-18
DOT 34	S-67
DOT 35	T-04
DOT 36	S-55

Study I.D. No.	Owner I.D. No.
DOT 37	G-68
DOT 38	H-70
DOT 39	C-90
DOT 40	G-08
DOT 41	K-38
DOT 42	D-32A
CNR 1	--
CNR 2	--
CNR 3	--
CNR 4	J-75
CNR 5	--
NBP 1	--
NBP 2	--
NBP 3	--
NBP 4	--
PWC 1	--
PWC 2	--

STUDY OF THE ALKALI-REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX D

DR. GILLOTT REPORT - PETROGRAPHY OF HARDENED CONCRETE
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  R18 (1971) Blackville 8
  CN4 (1952) Newcastle 9
  F20 (1955) Saint John 10
  N24 (1947) Fredericton 11
  CN2 (1953) Edmundston 12
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RECORD OF AGGREGATE SAMPLES AND RPC PETROGRAPHIC STUDIES
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STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
OF NEW BRUNSWICK

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R7	3
R8	6
R9	4
R10	3
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R12	2
R13	3
R14	4
R15	3
R16	3
R17	2
R18	3
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STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
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APPENDIX G

EQUIPMENT AND TEST METHODS
MIX DESIGN DATA FOR TEST SPECIMENS
MORTAR BAR AND CONCRETE PRISM TESTS

(bound under separate cover)

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STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

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Mortar Bar Data Sheets	72 pages
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STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX I

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CONCRETE SAMPLES-N B D O T

DOT NO.	STRUCTURE NO.	NAME OF STRUCTURE	DATE BUILT	COUNTY
1	P17	PARSONS BROOK #2	1936	KINGS & SAINT JOHN
2	P15	PARSONS BROOK #1	1928	KINGS & SAINT JOHN
3	T74	TROUT CREEK #2	1939	KINGS & SAINT JOHN
4	D52	DEFOREST OVERHEAD	1956	KINGS & SAINT JOHN
5	E22A	OLD EEL RIVER NEAR E22	1930+-	CARLETON
6	S46	SHOGOMOC RIVER (TCH)	1967	CARLETON
7	M12	MADAWASKA RIVER #4 (TCH)	1960	MADAWASKA
8	R09	RAPIDE DE FEMME #2	1955	VICTORIA
9	H26	HANSON GULCH	1938	VICTORIA
10	P57	PISGAN OVERHEAD (CNR)	1957	KINGS & SAINT JOHN
11	N24	NASHWAAK RIVER #5	1947	YORK
12	N16A	OLD NASHWAAK (NEAR N16)	1940	YORK
13	R48	RIVER GEORGE (NEW)	1937	YORK
14	R48A	RIVER GEORGE (OLD)	1920	YORK
15	---	SMALL BRIDGE AT PERTH	1936	VICTORIA
16*	B33	BARTIBOG RIVER #2	1950	NORTHUMBERLAND
17*	Y77	YORK MILLS	1939	YORK
18*	M16	MAGAGUADAVIC RIVER #9	1929	YORK
19**	B90	BROOKVILLE OVERHEAD	1939	KINGS & SAINT JOHN
0**	B60	BLAIR OVERHEAD	1939	KINGS & SAINT JOHN
21	H28	HAILES BROOK #7	1945	RESTIGOUCHE
22	B43	BIG FORKS BROOK	1930	VICTORIA (MADAWASKA)
23	T20	TEAGUES BROOK	1930	GLOUCESTER
24	B35	BENGAMIN RIVER #1	1931	RESTIGOUCHE
25	L68	LOUISON RIVER #1 (B60)	1933	RESTIGOUCHE
26	C40	CHRISTOPHER BROOK #1	1931	RESTIGOUCHE
27*	W26	NEREPIS OVERPASS	1950	KINGS & SAINT JOHN
28	F20	FERGUSON BROOK (GREGG)	1955	SAINT JOHN (CHARLOTTE)
29	L84	LORNEVILLE ROAD OVERPASS	1973	SAINT JOHN (CHARLOTTE)
30	H27	HANSON STREAM #2	1961	SAINT JOHN (CHARLOTTE)
31	N26	NEW RIVER #1	1942	CHARLOTTE
32	N26A	OLD ABUT NEAR N26	1904	CHARLOTTE
33	R18	RENOUS RIVER #1	1971	NORTHUMBERLAND
34	S67	S.W.MIRAMICHI #1 (QUVLE)	1912	NORTHUMBERLAND
35	T04	TABUSINTAC RIVER #1	1970	NORTHUMBERLAND
36	S55	SOUTH POKEMOUCHE RIVER #1	1958	GLOUCESTER
37	G68	GORGE ROAD OVERHEAD (TCH)	1959	WESTMORLAND & ALBERT
38	H70	HUMPHREY BROOK #2	1952	WESTMORLAND & ALBERT
39	C90	CRANK BROOK #1	1949	WESTMORLAND & ALBERT
40	G08	GASPEREAU RIVER #1	1934	WESTMORLAND & ALBERT
41	K38	KENNEBECASIS RIVER #1	1968	KINGS & SAINT JOHN
42	D32A	DENNIS STREAM #2	1921	CHARLOTTE

104 pp

MICROMEDIA

CNR

CONCRETE SAMPLES -CNR

1	SHOGOMOC (NEAR S46)	1913	MADAWASKA
2	MADAWASKA RIVER (NEAR M12)	1953	MADAWASKA
3	GREEN RIVER	1911	MADAWASKA
4	JONES CROSSING (J75)	1952	NORTHUMBERLAND
5	S W MIRAMICHI (QUARRY)	1945	NORTHUMBERLAND

NBP

CONCRETE SAMPLES-N B POWER

1	OLD GRAND FALLS MONUMENT	1928+-	VICTORIA
2	MACTAQUAC DAM	1965-68	YORK
3	EAST MUSQUASH DAM	1921	SAINT JOHN
4	WEST MUSQUASH DAM	1921	SAINT JOHN

PWC

CONCRETE SAMPLES-PWC

1*	JEMSEG WHARF	1930'S	QUEENS
2**	EDMUNDSTON-MADAWASKA (INTERNATIONAL BRIDGE)	1921	MADAWASKA

DD

CONCRETE SAMPLES-SAINT JOHN DRY DOCK

1	DRY DOCK		SAINT JOHN

* CHUNK SAMPLES OF CONCRETE
** OLD CONCRETE CORE SAMPLES

ADI No. - DOT 1

OWNER I.D. No. - P-17

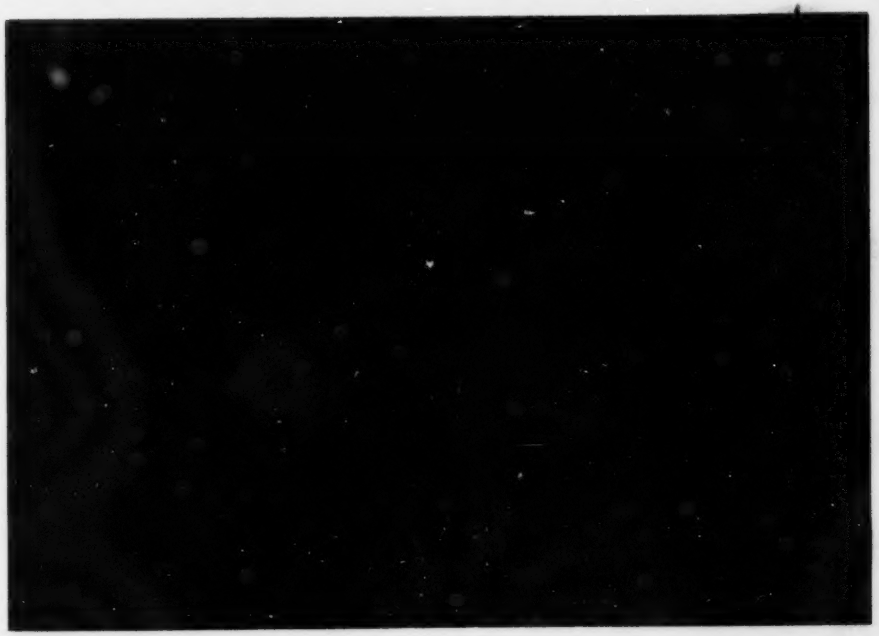
LOCATION - PARSONS BROOK #2

DATE OF CONSTRUCTION - 1936

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 2

Owner I.D. No. - P-15

Location - PARSONS BROOK #1

Date of construction - 1928

General comments:

Aggregate sources:

Cement sources:

ADI No. - DOT 3

Owner I.D. No. - T-74

Location - Trout Creek #2

Date of construction - 1939

General comments:

Aggregate sources:

Cement sources:

ADI No. - DOT 4

OWNER I.D. No. - D52

LOCATION - DEFOREST OVERHEAD

DATE OF CONSTRUCTION - 1956

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 5

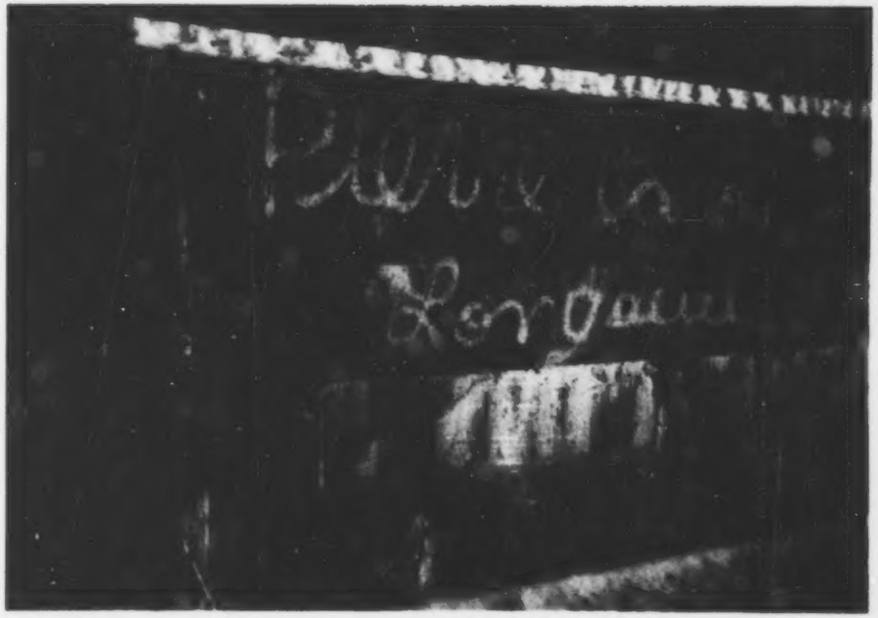
Owner I.D. No. - E-22 A

Location - old Meductic Bridge

Date of construction - 1930±

General comments:

- serious cracking



Aggregate sources:

Cement sources:

ADI No. - DOT 6

Owner I.D. No. - S-46

Location - Shogomoc Highway Br.

Date of construction - 1967

General comments:

- Traces of pattern cracking

Aggregate sources:

Cement sources:

ADI No. - D.O.T. 7

Owner I.D. No. - M-12

Location. - Madawaska River (TCH)

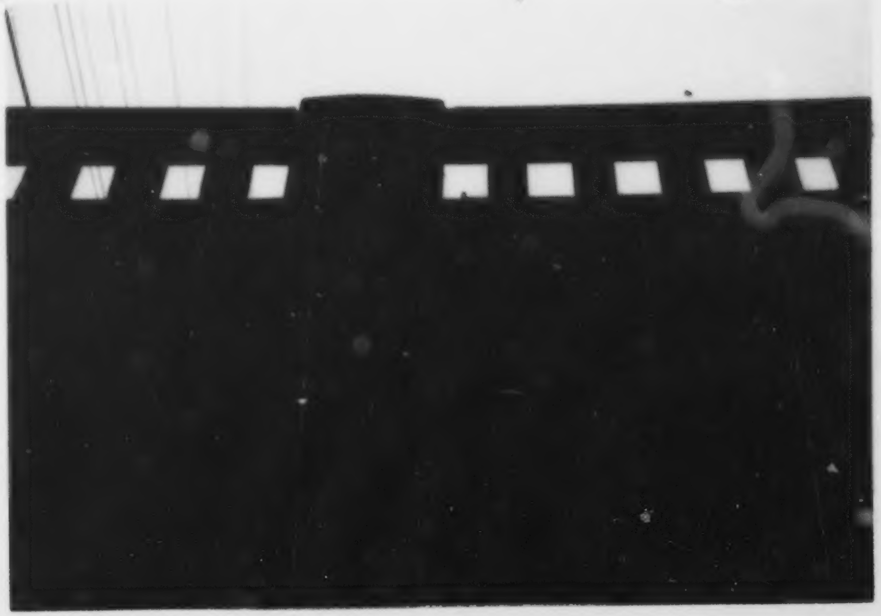
Date of Construction - 1960

General Comments:

- May be slight pattern cracking, abut. wall east side.
- Piers look O.K.
- Cracking may only be on finish not obvious elsewhere

Aggregate Sources:

Cement Sources:



ADI No. - DOT 8

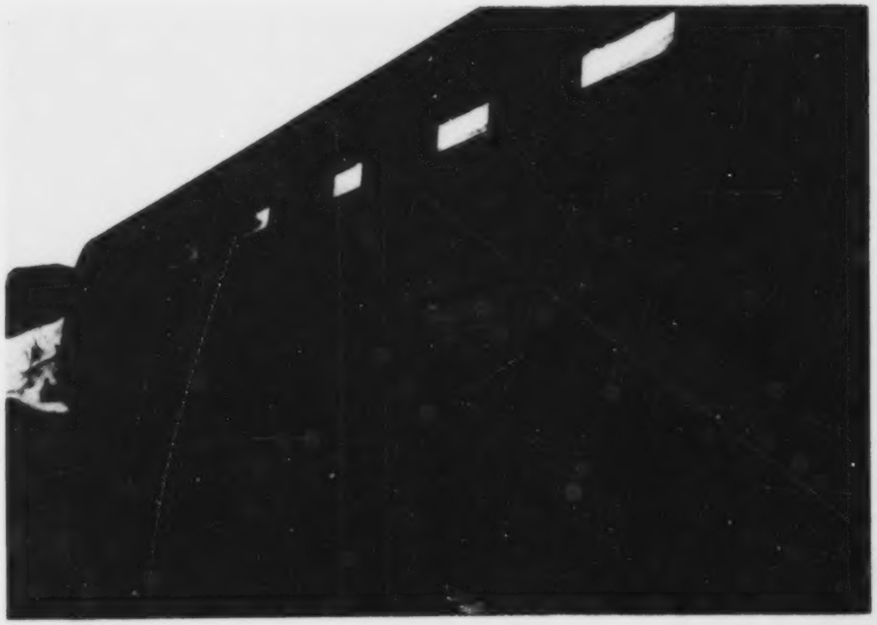
OWNER I.D. No. - R-09

LOCATION - OLD #2 RAPIDE DE FEMME

DATE OF CONSTRUCTION - 1955

GENERAL COMMENTS:

- HAS HAD MINOR REPAIRS TO GUARD RAIL
- WING WALLS SHOW VERY FINE DEVELOPING PATTERN
- S/W ABUTMENT SHOWS TYP. PATTERN CRACKS
- U/S DECK GOOD



AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 9

Owner I.D. No. - H-26

Location - HANSON GULCH BRIDGE

Date of construction - 1938

General comments:

- SOME CRACKING ON END POSTS
- DEFINITELY EXPANSIVE PROBLEM
- NOT IN GUARD RAILS
- U/S DECK EXTENSIVELY CRACKED ALTHOUGH NOT LEACHING BADLY
- STRUTS PUSHING COLUMNS

Aggregate sources:

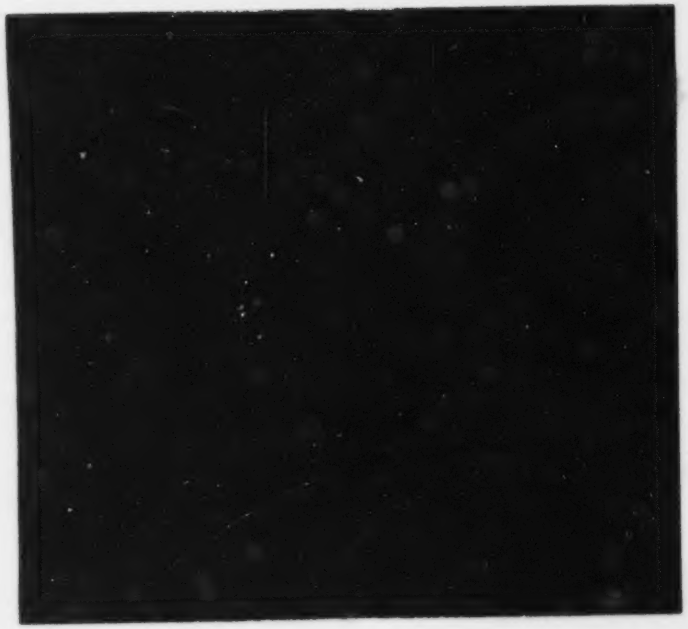
Cement sources:

ADI No. - DOT 10
OWNER I.D. No. - P-57
LOCATION - PISGAN OVERHEAD (CNR)

DATE OF CONSTRUCTION - 1957
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 11

Owner I.D. No. - N·24

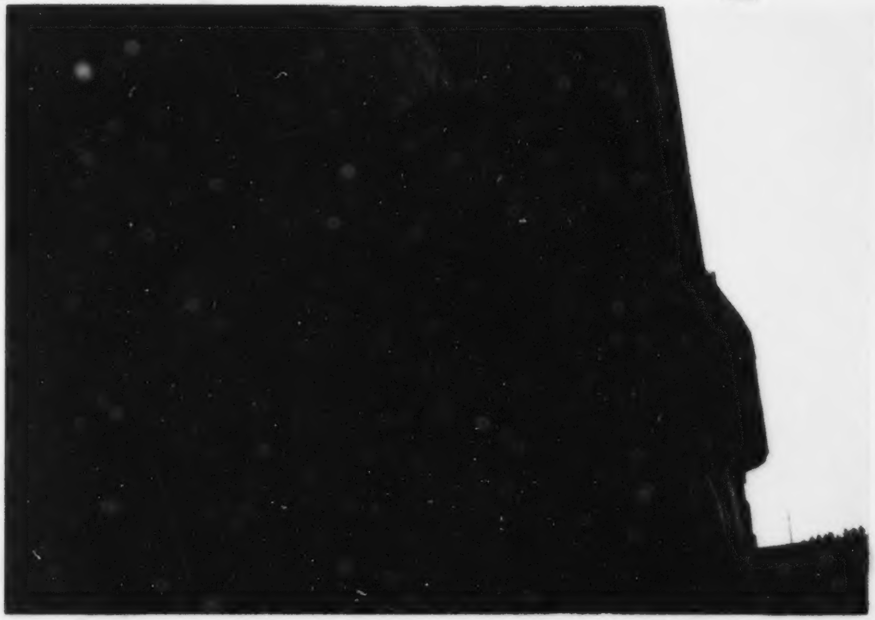
Location - Nashwaak River

Date of construction - 1947

General comments:

Aggregate sources:

Cement sources:

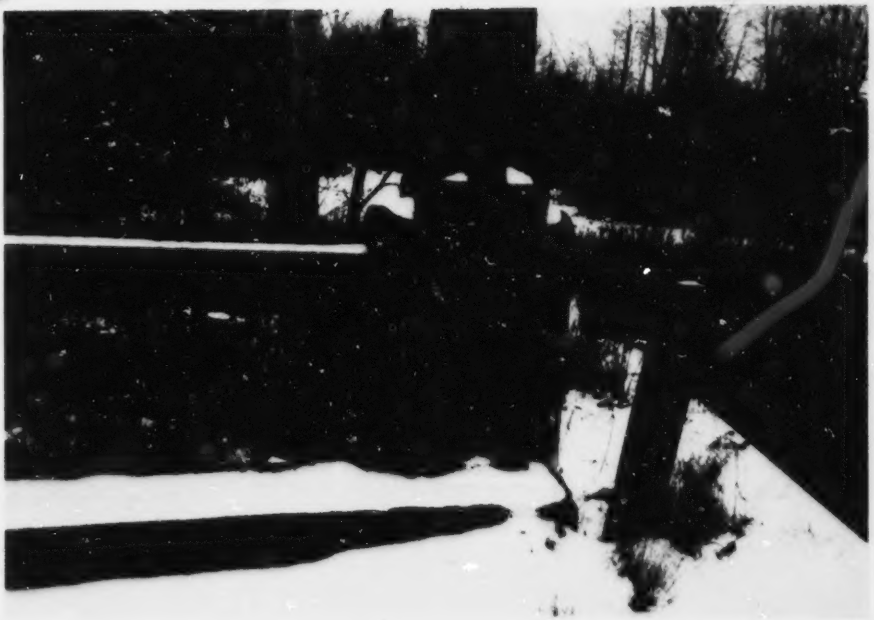


ADI No. - DOT 12
OWNER I.D. No. - N 16 A
LOCATION - OLD NASHWAAK

DATE OF CONSTRUCTION - 1940
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 13 & 14

Owner I.D. No. - R48 & R48A (resp)

Location - River George

Date of construction - 1937 & 1920 (resp)

General comments:

Aggregate sources:

Cement sources:

ADI No. - DOT 15

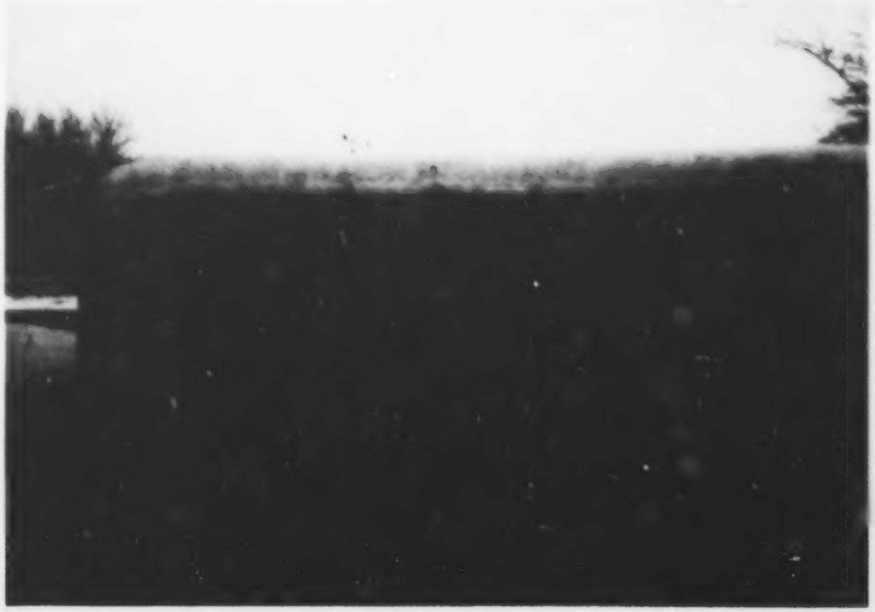
OWNER I.D. No. -

LOCATION - SMALL BRIDGE PERTH -
ANDOVER

DATE OF CONSTRUCTION - 1936

GENERAL COMMENTS:

- VERY GOOD CONDITION



AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 16

OWNER I.D. No. - B33

LOCATION - BARTIBOG RIVER # 2

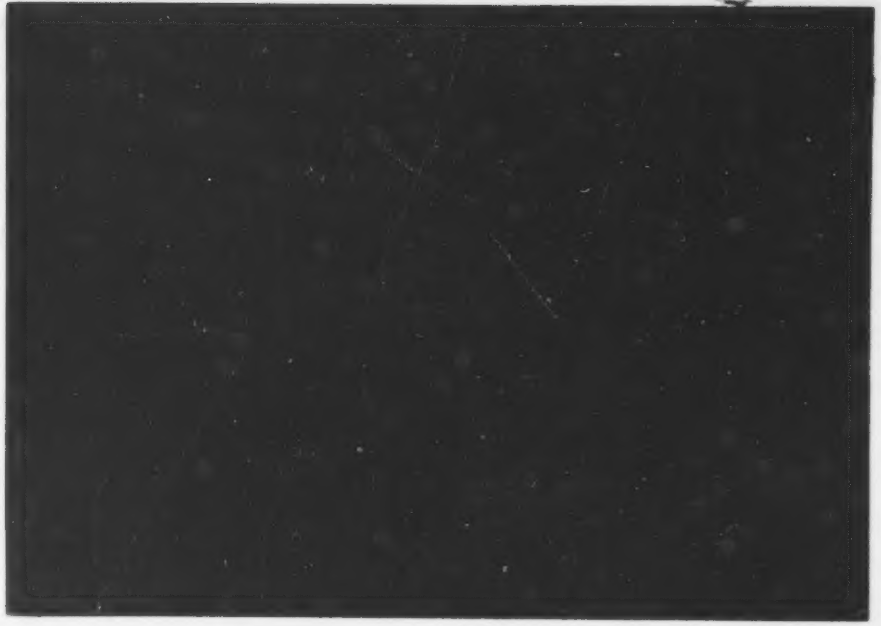
DATE OF CONSTRUCTION - 1950

GENERAL COMMENTS:

- PATTERN CRACKS & LEACHING, CRACKS DON'T SEEM TOO DEEP
- NEW RAILS

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 17

OWNER I.D. No. - Y-77

LOCATION - YORK MILLS

DATE OF CONSTRUCTION - 1939

GENERAL COMMENTS:

- SLIDES ONLY

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 18
OWNER I.D. No. - M-16
LOCATION - MAGAGUADAVIC RIVER

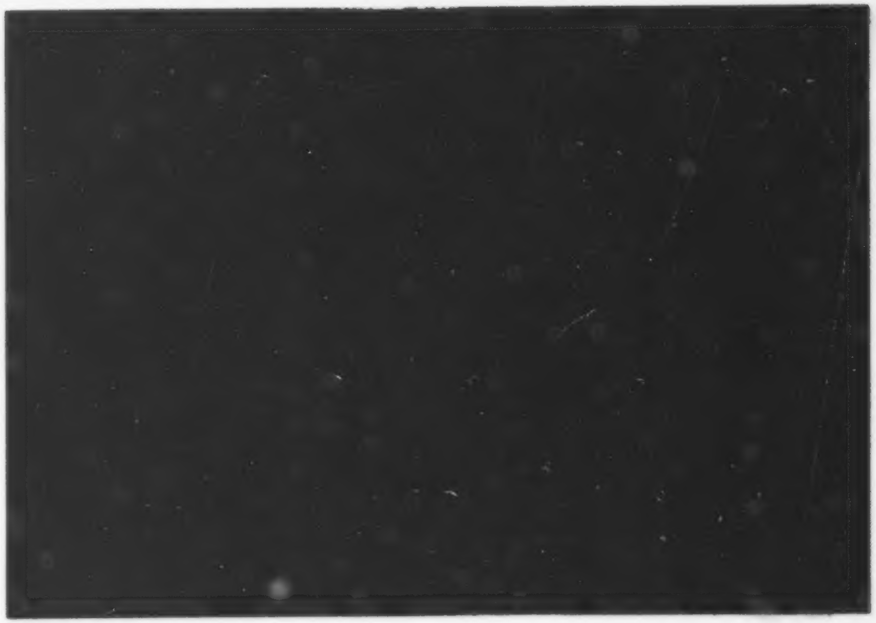
DATE OF CONSTRUCTION - 1929
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 18
OWNER I.D. No. - M-16
LOCATION - MAGAGUADAVIC RIVER

DATE OF CONSTRUCTION - 1929
GENERAL COMMENTS:



AGGREGATE SOURCES:

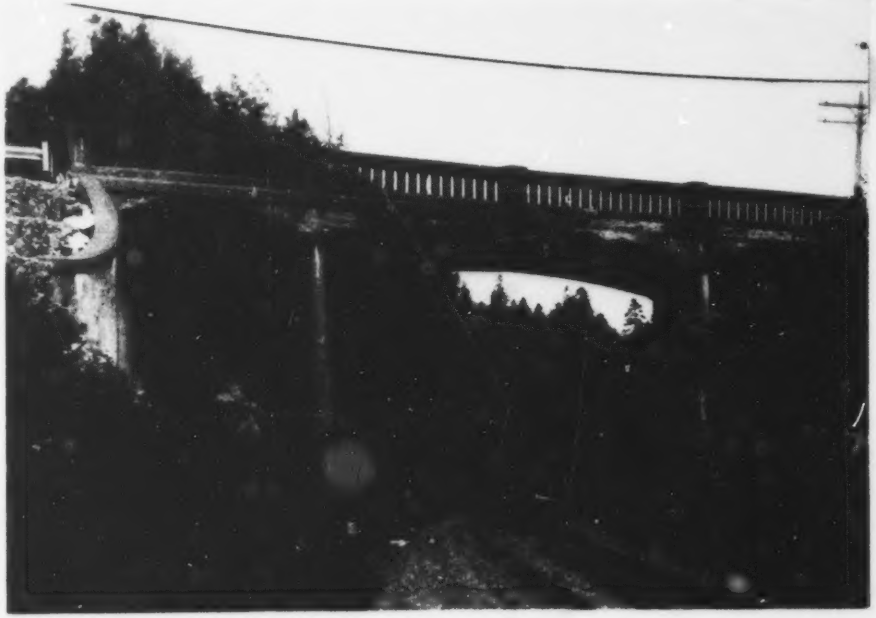
CEMENT SOURCES:

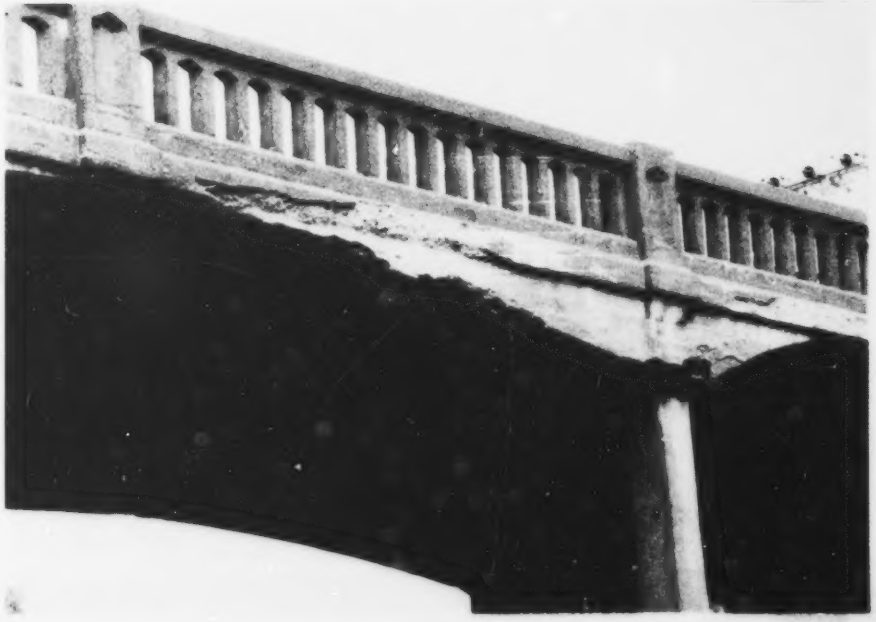
ADI No. - DOT 19
OWNER I.D. No. - B 90
LOCATION - BROOKVILLE OVERHEAD

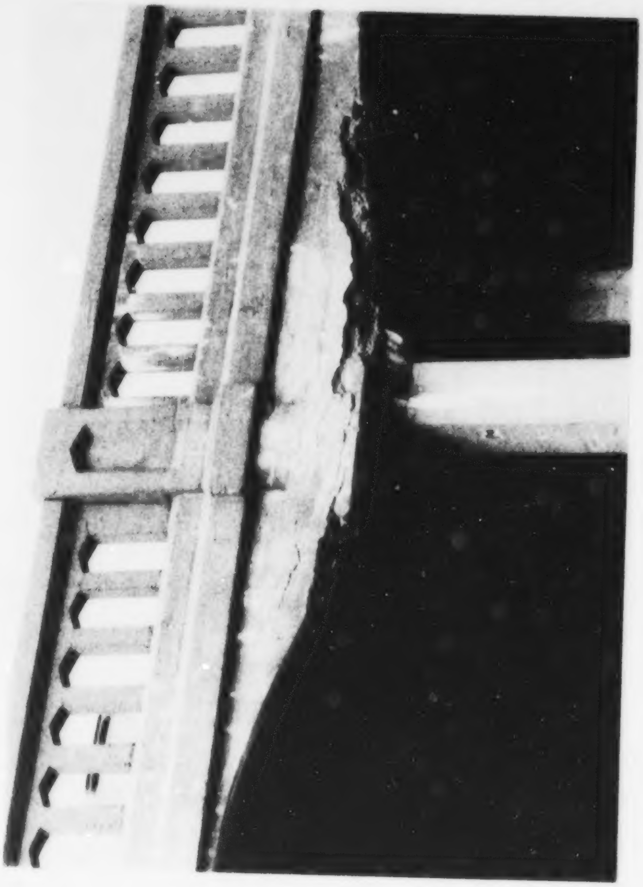
DATE OF CONSTRUCTION - 1939
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

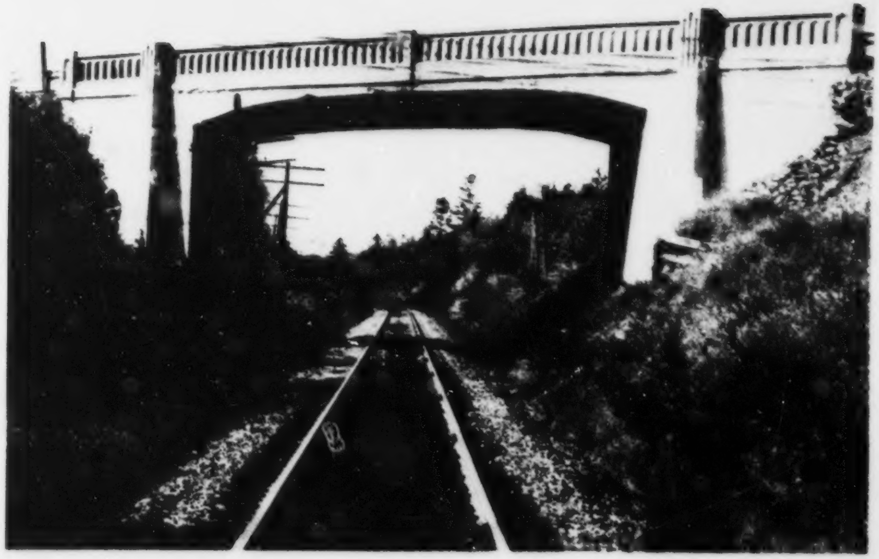


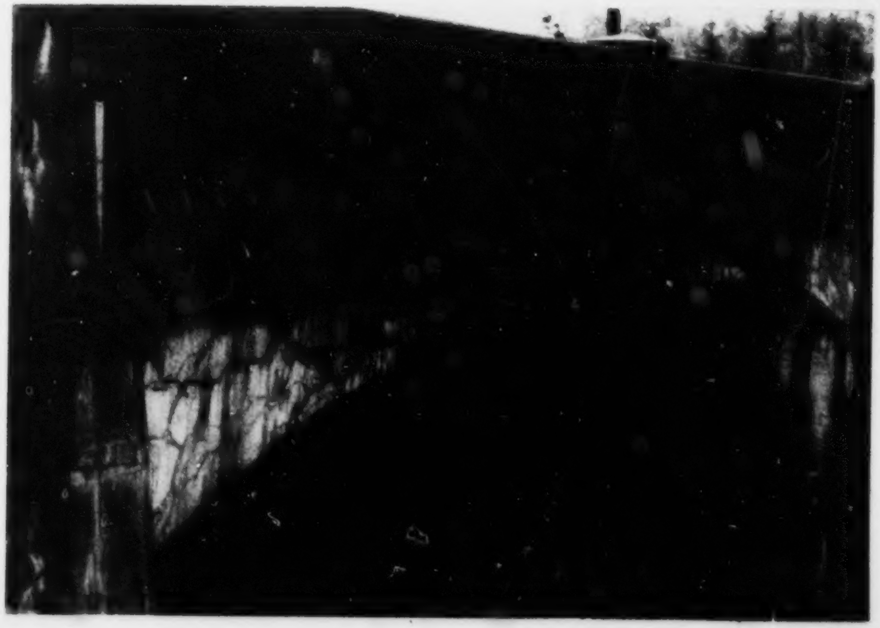




ADI No. - DOT 20
OWNER I.D. No. - B-60
LOCATION - BLAIR OVERHEAD

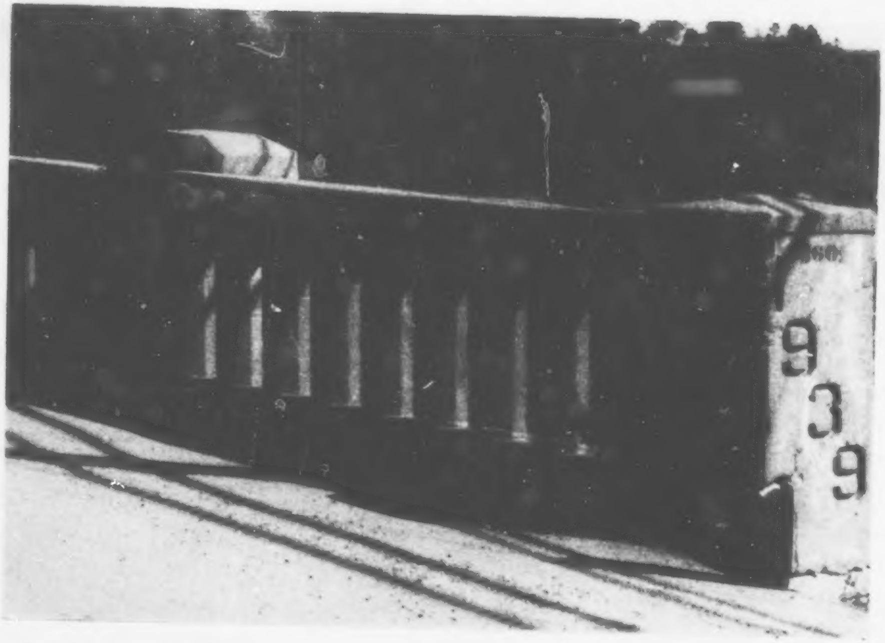
DATE OF CONSTRUCTION - 1939
GENERAL COMMENTS:





AGGREGATE SOURCES:

CEMENT SOURCES: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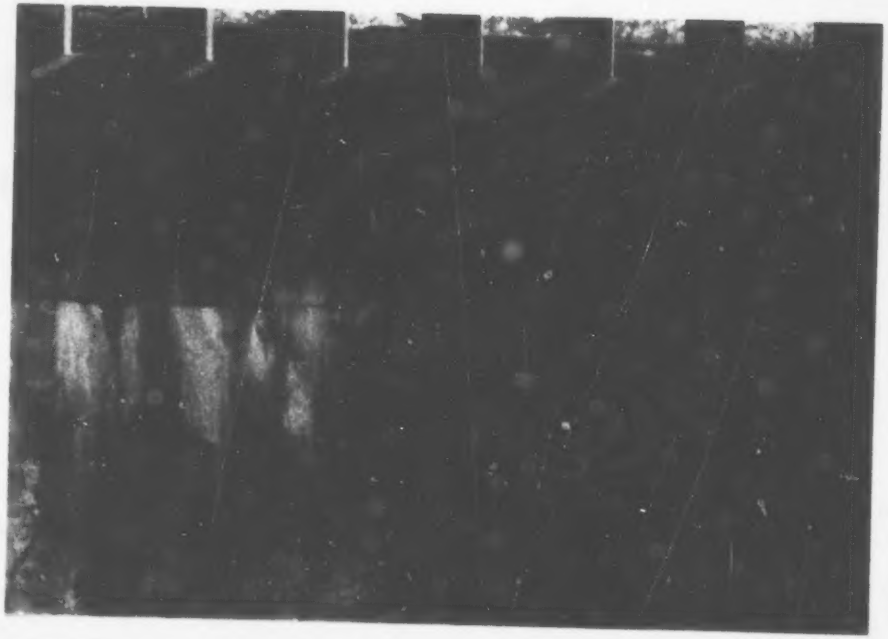
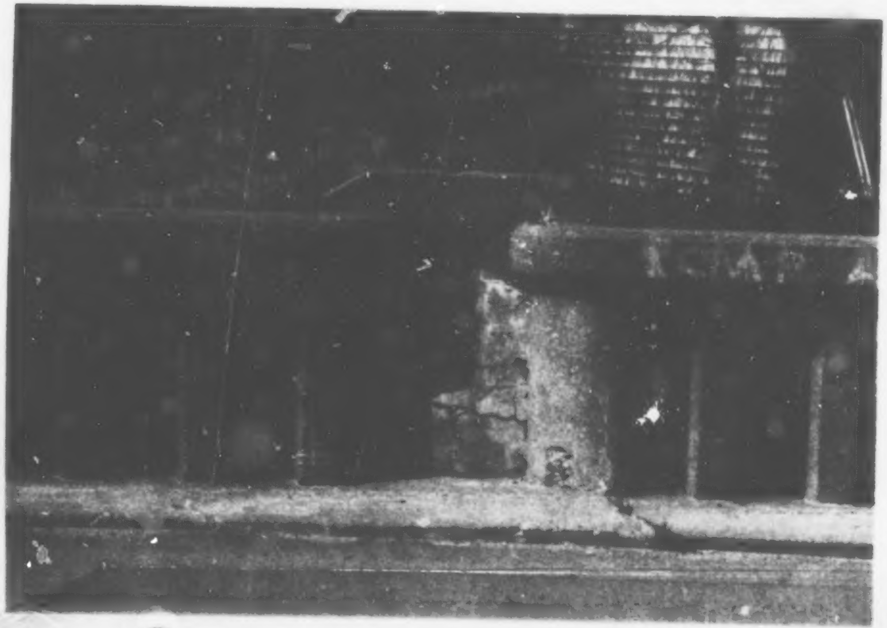
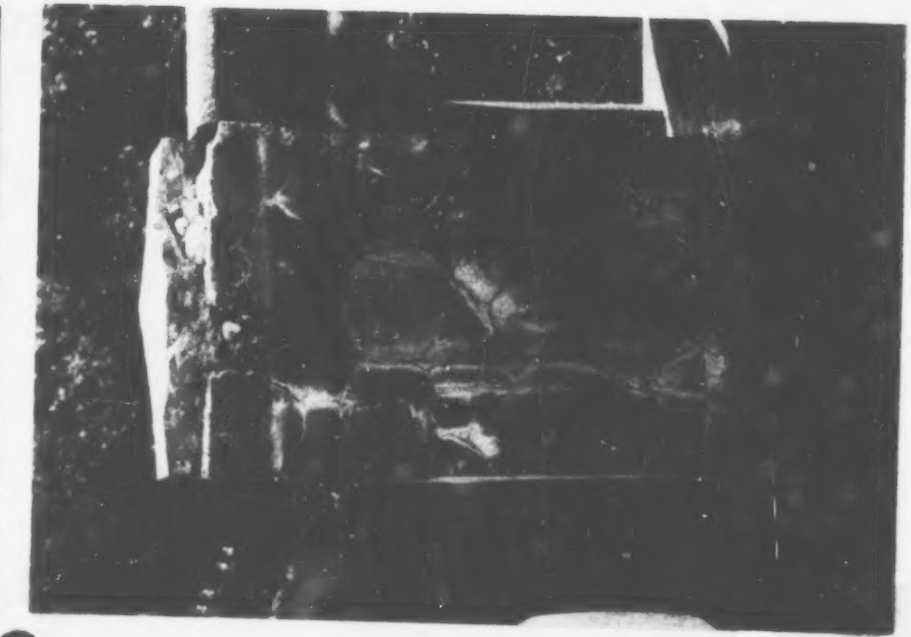






ADI No. - DOT 21

Owner I.D. No. - H·28

Location - Hailes Brook #7

Date of construction - 1945

General comments:

- Fairly extensive pattern cracking
- U/S deck good
- Lot of subhorizontal cracks

Aggregate sources:

Cement sources:

ADI No. - D.O.T. 22

OWNER I.D. No. - B43

LOCATION - BIG FORKS BROOK

DATE OF CONSTRUCTION - 1930

GENERAL COMMENTS:

- D/S WING WALL SHOWS LARGE SCALE PATTERN CRACKING
- REMAINDER LOOKS PRETTY GOOD
- U/S END REBUILT

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 23

OWNER I.D. No. - T-20

LOCATION - TEAGUES BROOK

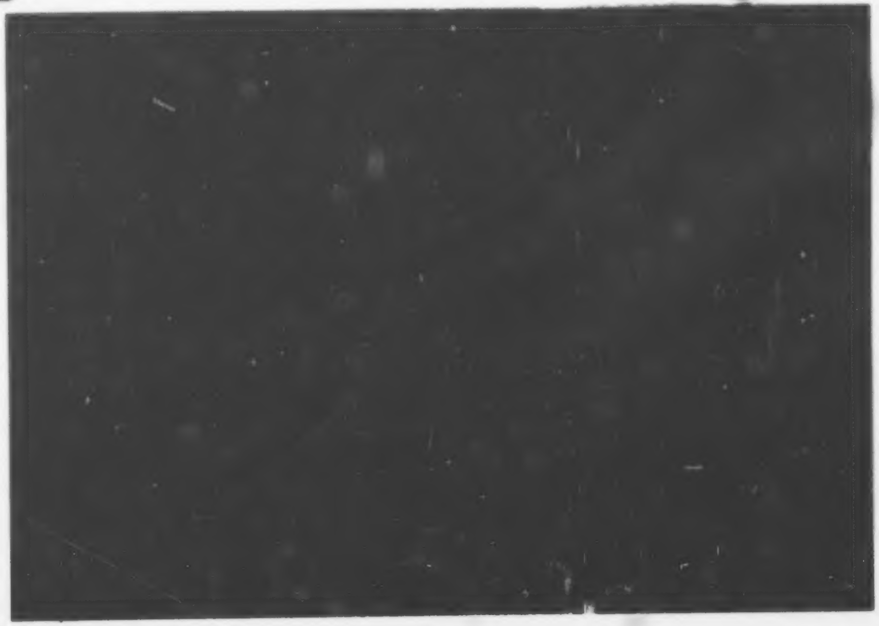
DATE OF CONSTRUCTION - 1930

GENERAL COMMENTS:

- BADLY CRACKED
- GUARD RAIL O.K.
- ABUTMENT SIDE WALLS BAD
- U/S DECK O.K.

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 24

Owner I.D. No. - B-35

Location - Benjamin River # 1

Date of construction - 1931

General comments:

- Looks O.K.
- Older abut. looks good too, has some scaling

Aggregate sources:

Cement sources:

ADI No. - DOT 25
Owner I.D. No. - L-68
Location - Louison River # 1

Date of construction - 1933
General comments:
- extensive leaching & cracking

Aggregate sources:

Cement sources:

ADI No. - DOT 25

OWNER I.D. No. - L68

LOCATION - LOUISON RIVER # 1

DATE OF CONSTRUCTION - 1933

GENERAL COMMENTS:

- NO PICTURES AVAILABLE

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 26

OWNER I.D. No. - C-40

LOCATION - CHRISTOPHER BROOK # 1

DATE OF CONSTRUCTION - 1931

GENERAL COMMENTS:

- ONE ABUTMENT NEW, OTHER LOOKS GOOD

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 27

OWNER I.D. No. - W-26

LOCATION - NEREPIS OVERPASS

DATE OF CONSTRUCTION - 1950

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 27

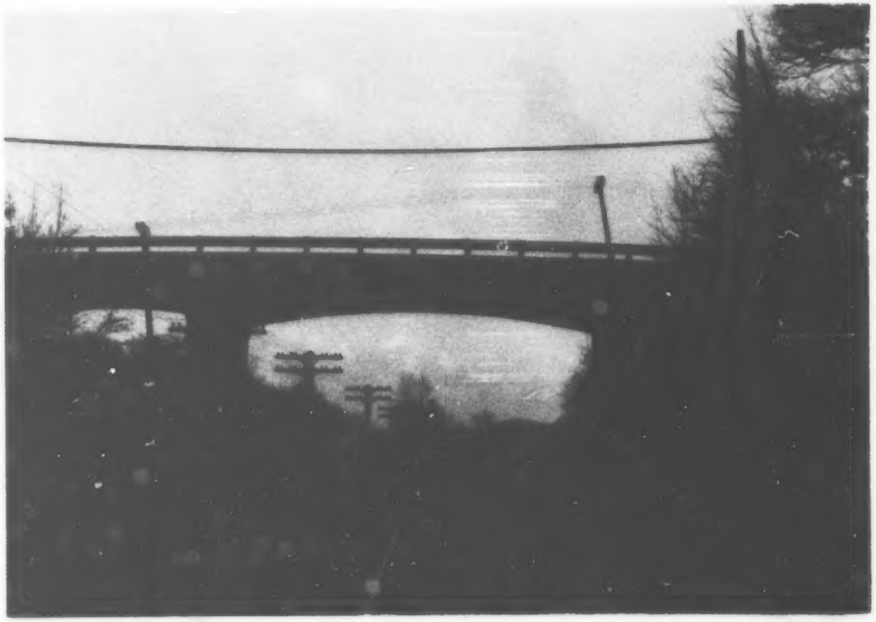
Owner I.D. No. - W-26

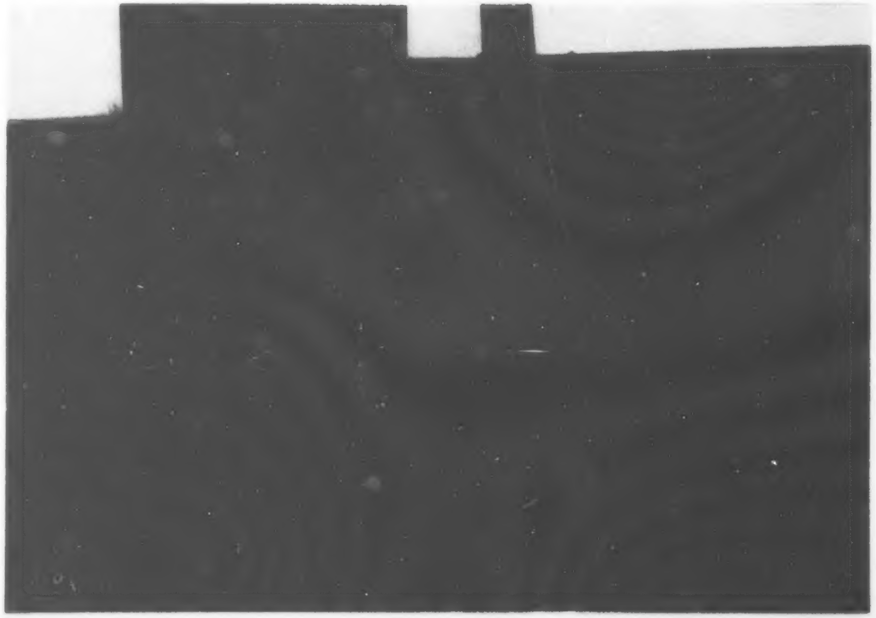
Location - Nerepis Overpass

Date of construction - 1950

General comments:

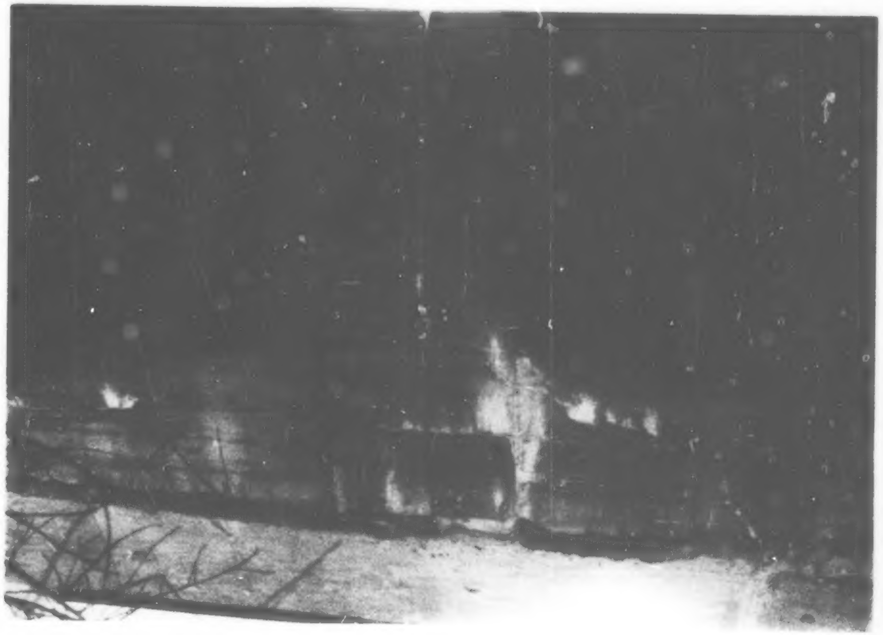
- After reconstruction (1984)





Aggregate sources:

Cement sources:



ADI No. - DOT 28

OWNER I.D. No. - F-20

LOCATION - FERGUSON BROOK

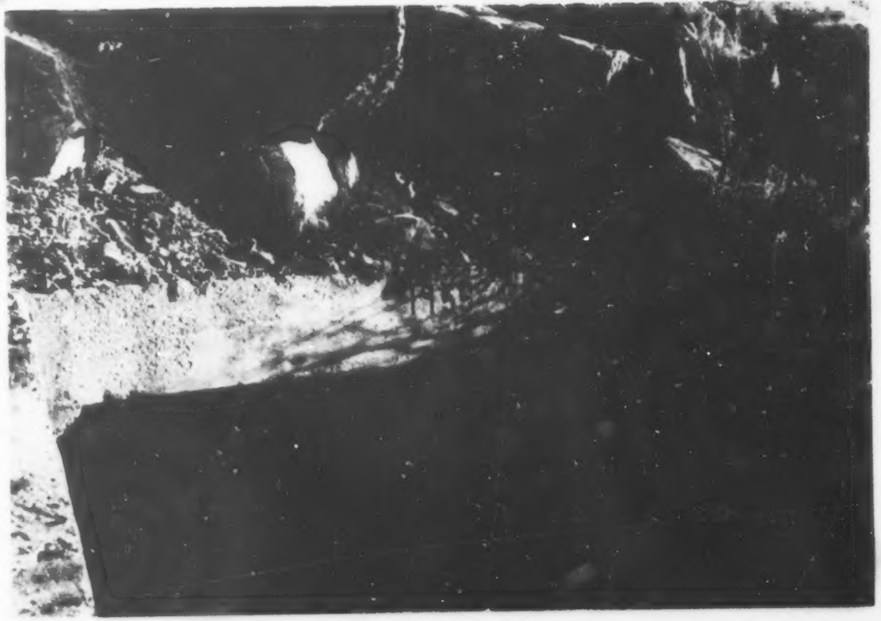
DATE OF CONSTRUCTION - 1955

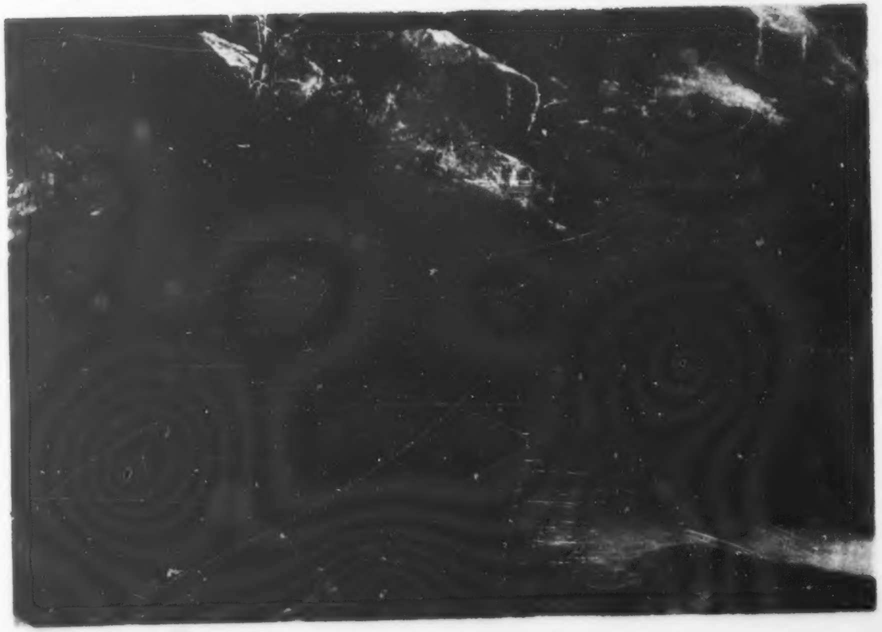
GENERAL COMMENTS:

- SOME A.A. IN UPSTREAM (SOUTH) END WALLS, ON LOWER END WALLS.
- AGGREGATE 20 mm MAX SIZE ROUNDED AGG. ONLY
- SOME OF DULL RED PARTICLES THAT DR JACK GILLIS WAS CONCERNED WITH

AGGREGATE SOURCES:

CEMENT SOURCES:





ADI No. - DOT 29

Owner I.D. No. - L-84

Location - LORNEVILLE ROAD OVERPASS

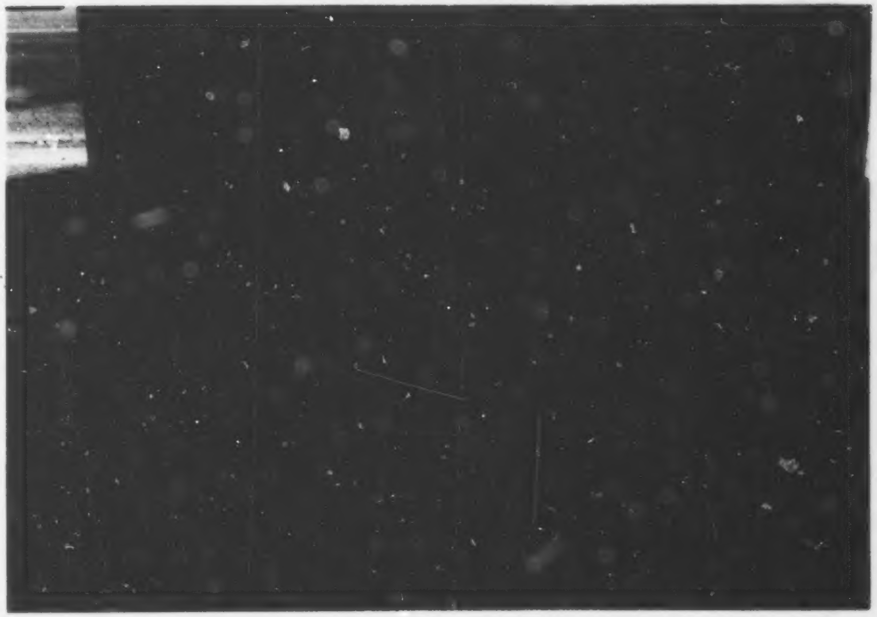
Date of construction - 1973

General comments:

- SOME SIGNS OF A.A. ON END WALLS & RAILING. RED STAINS ARE FAINT (SOME RED ROCK). 20 mm MAX. AGG. SIZE, ALL ROUNDED. ABOUT 40 % C.A. BRIDGE LIES N-S SO ONE SIDE NOT EXPOSED TO MAX. DRYING. IN PLACES WHERE SALT CAN NOT BE SPLASHED THE CRACKING CAN BE SEEN BUT ONLY WHERE EXPOSED TO SUN.

Aggregate sources:

Cement sources:



ADI No. - DOT 29

OWNER I.D. No. - L-84

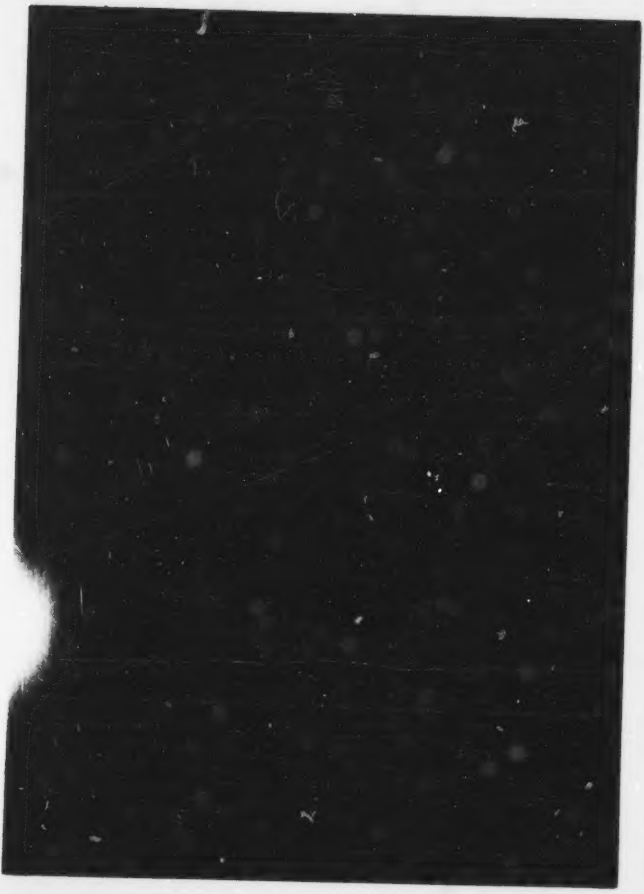
LOCATION - LORNEVILLE ROAD OVERPASS

DATE OF CONSTRUCTION - 1973

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 30

OWNER I.D. No. - H-27

LOCATION - HANSON STREAM #2

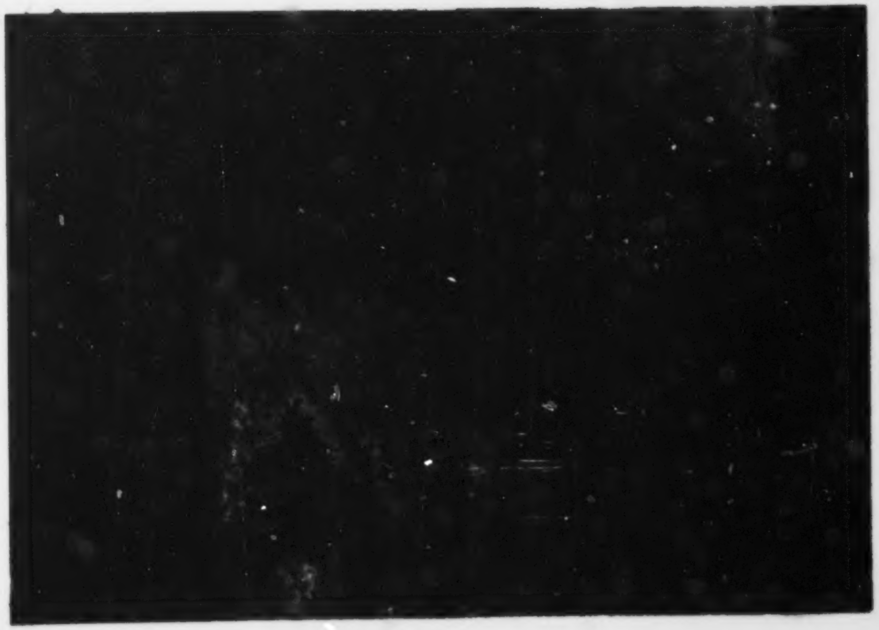
DATE OF CONSTRUCTION - 1961

GENERAL COMMENTS:

- ALL OF BRIDGE IS EXCELLENT, SHOWS NO SIGNS OF A.A. REACTION EXCEPT ON COLUMN FOOTINGS AND ONE ABUT. THESE HAVE A WHITE EFFORVESCENCE. SYMTOMATIC OF $CACL_2$ (OR NACL). THIS CON. HAS A DARKER COLOUR, SOME A.A. CRACKING, WHITE DEPOSITS (1-2 mm THICK OF SOFT MTL) & SEVERE SURFACE DETERIORATION

AGGREGATE SOURCES:

CEMENT SOURCES:



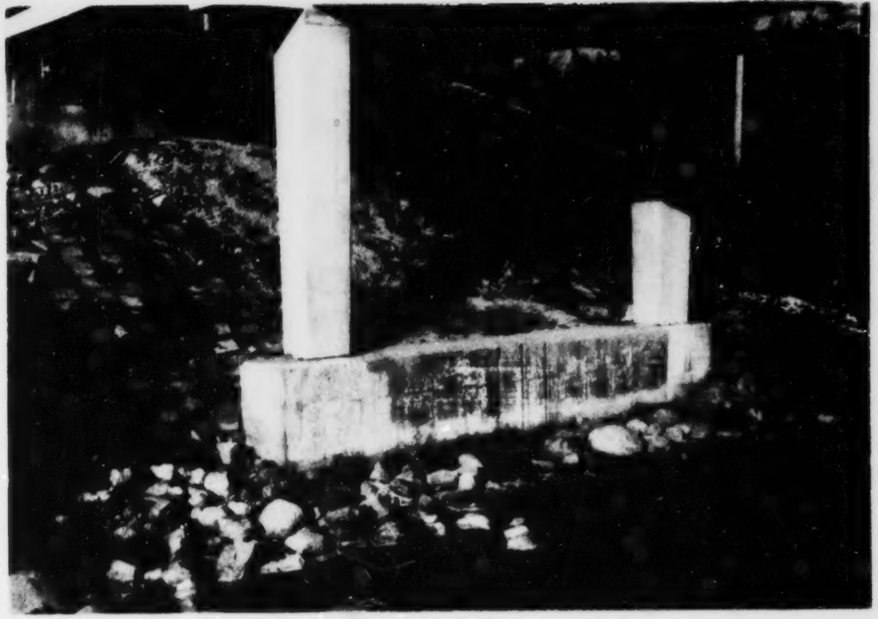
ADI No. - DOT 30

Owner I.D. No. - H-27

Location - HANSON STREAM #2

Date of construction - 1961

General comments:

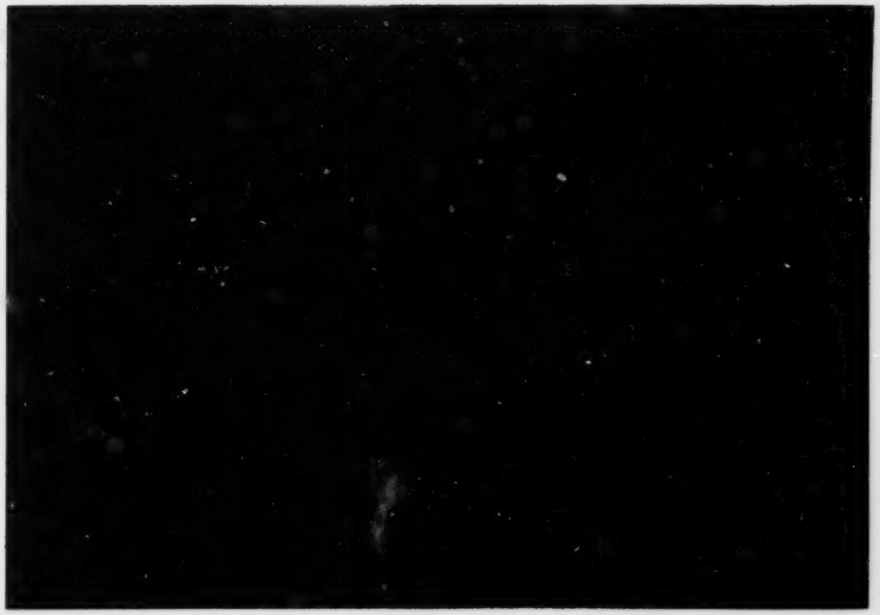


Aggregate sources:

Cement sources:

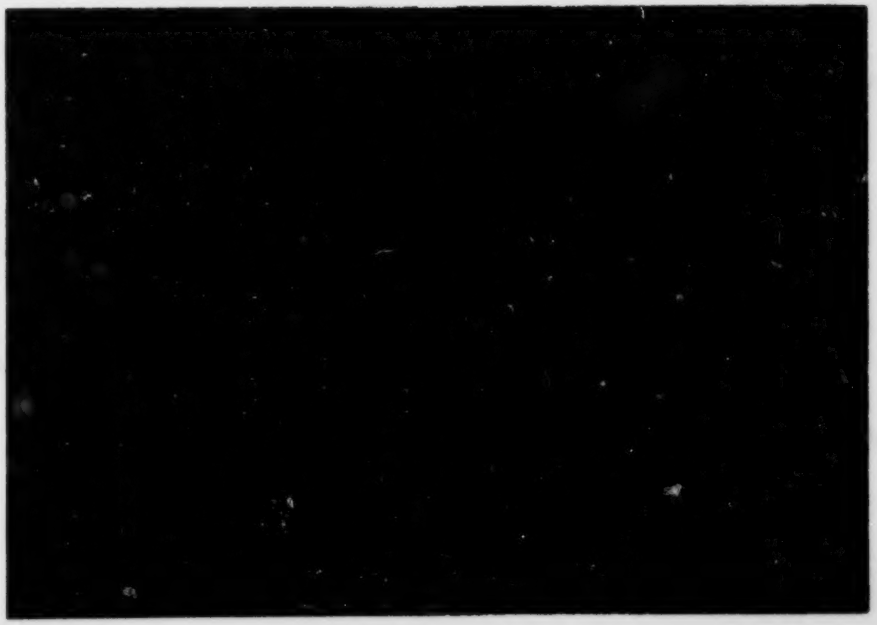
ADI No. - DOT 30
OWNER I.D. No. - H-27
LOCATION - HANSON STREAM # 2

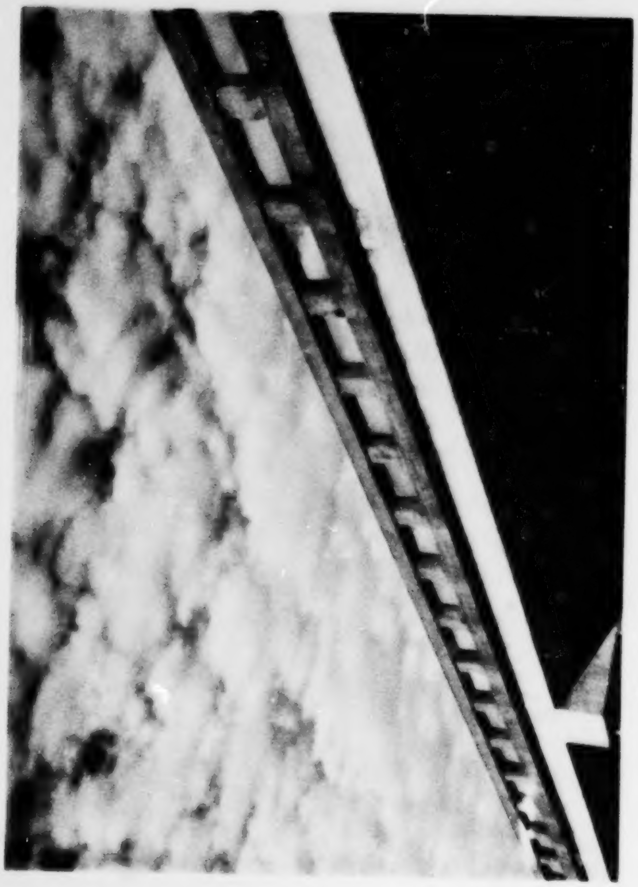
DATE OF CONSTRUCTION - 1961
GENERAL COMMENTS:

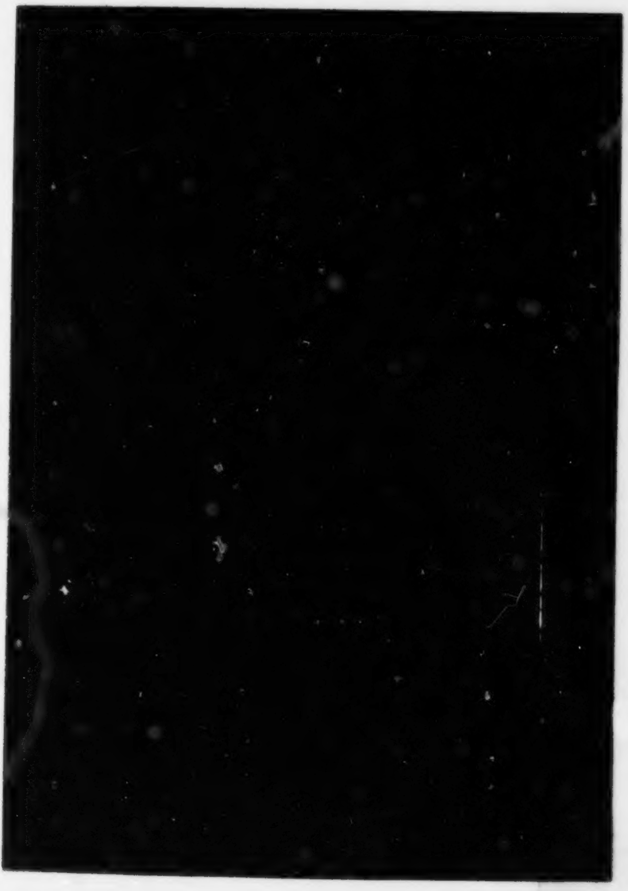


AGGREGATE SOURCES:

CEMENT SOURCES:





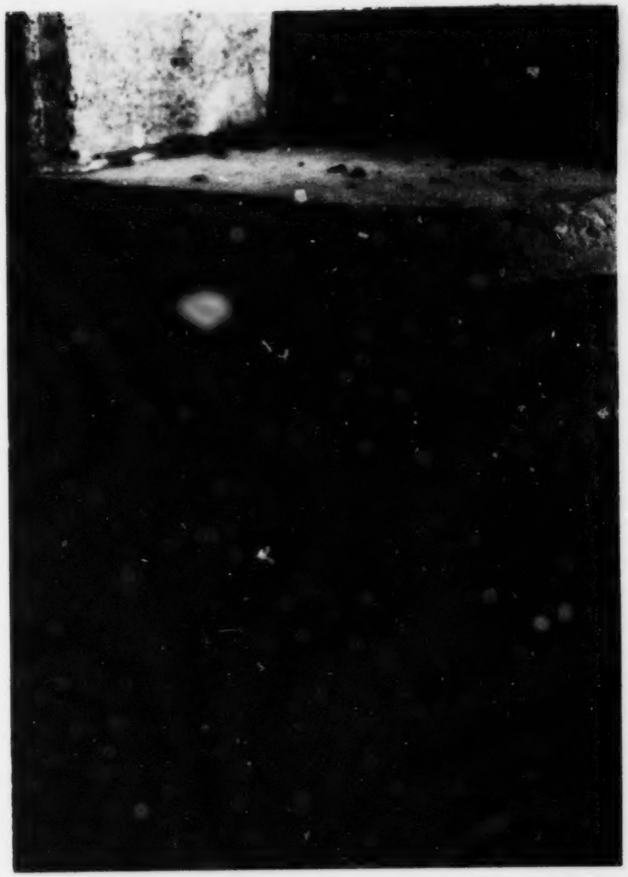


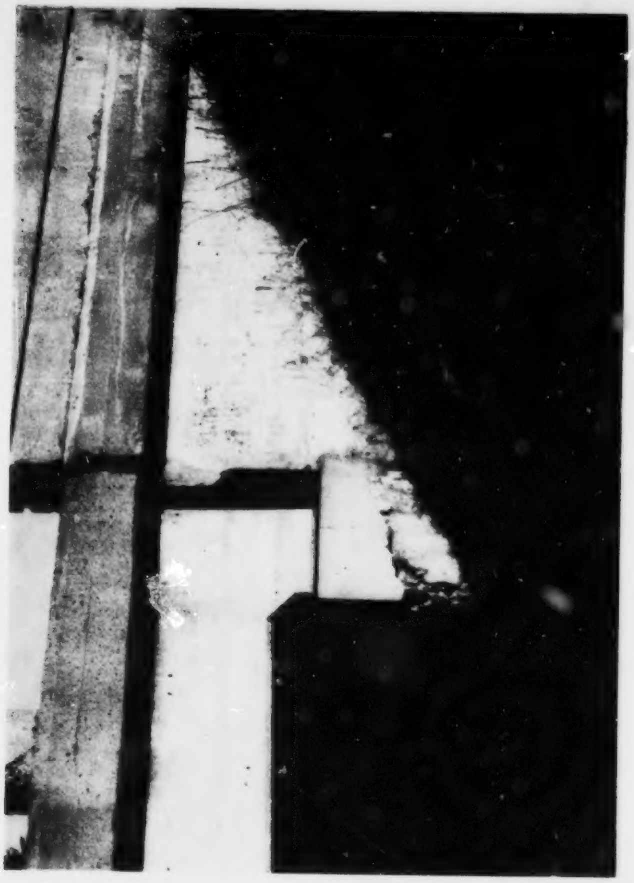
ADI No. - DOT 30
OWNER I.D. No. - H-27
LOCATION - HANSON STREAM # 2

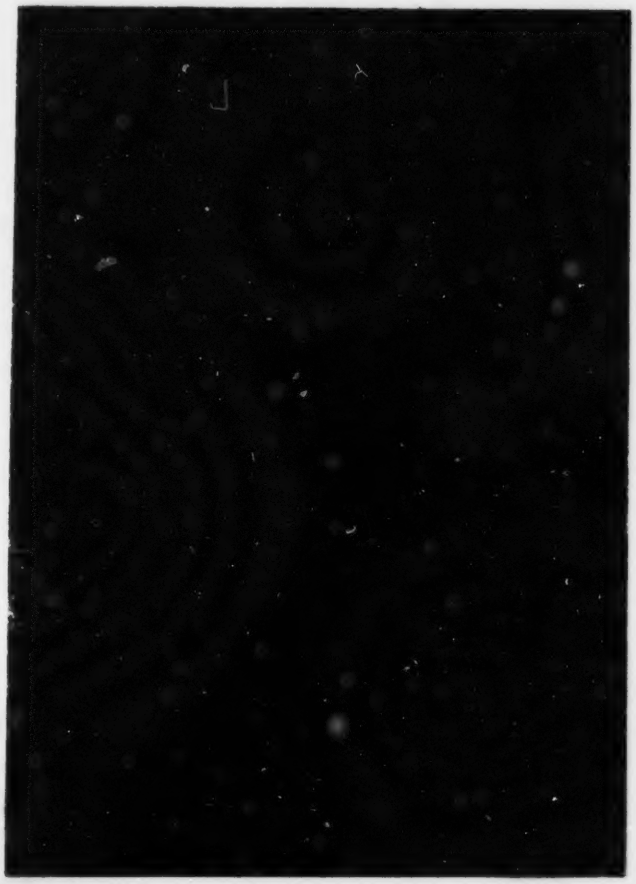
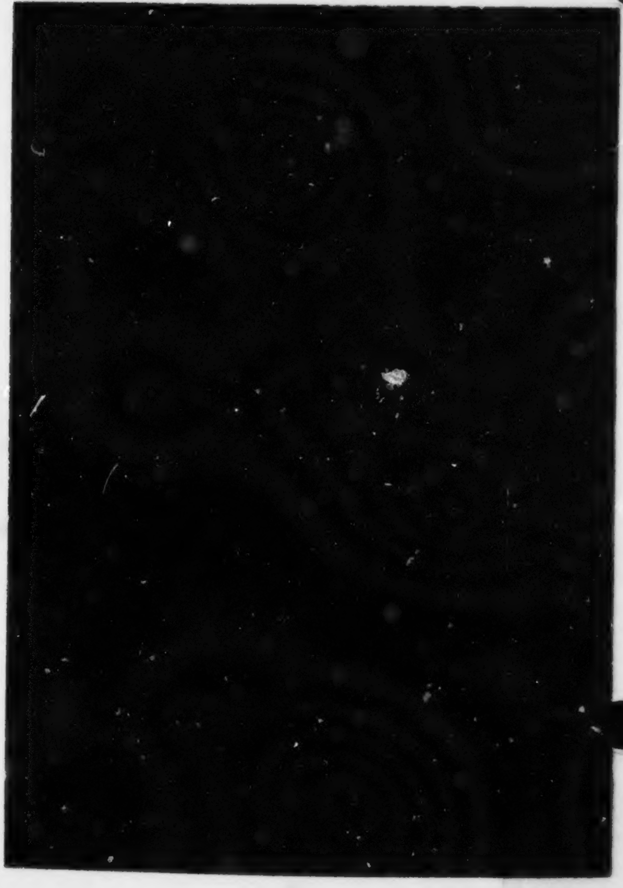
DATE OF CONSTRUCTION - 1961
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:





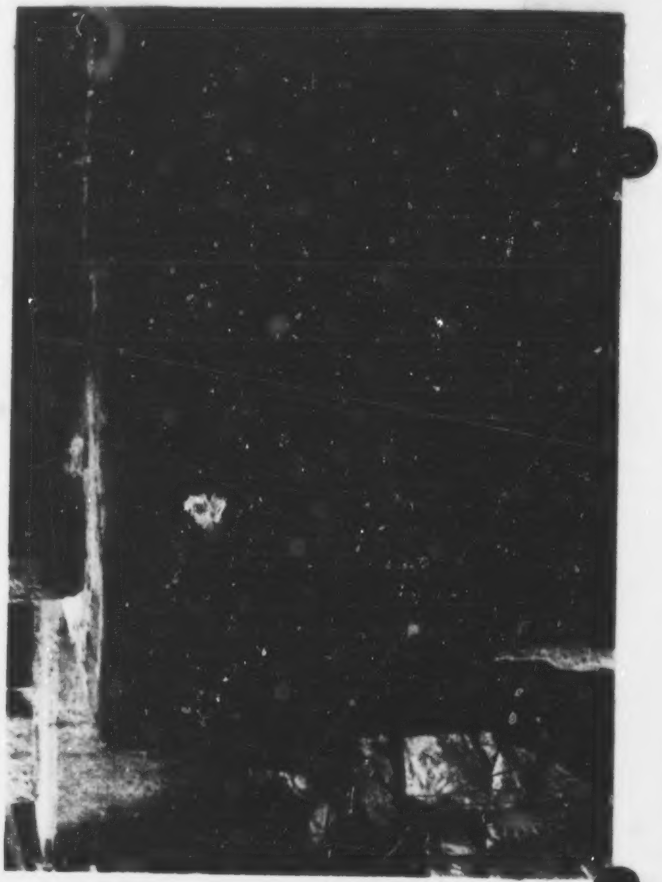



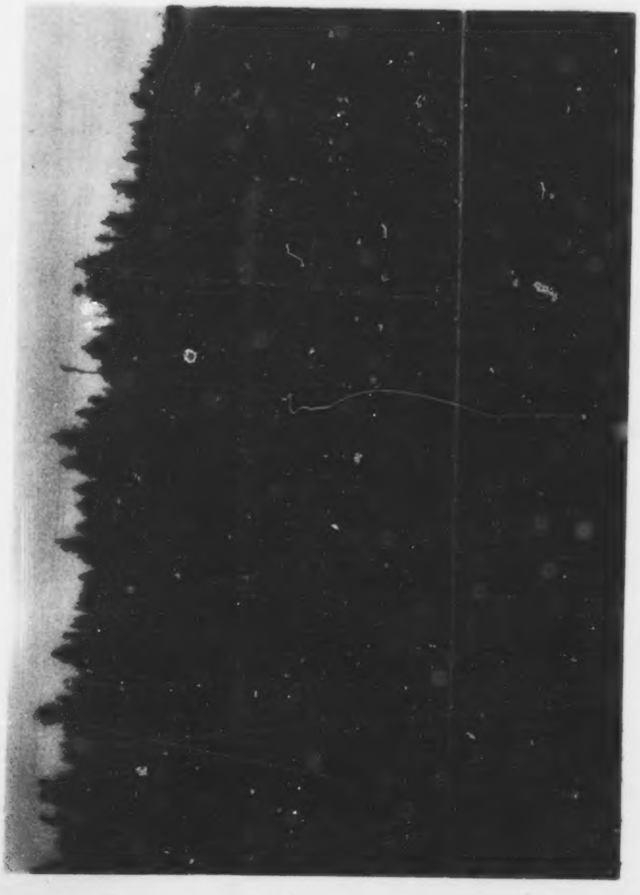
ADI No. - DOT 31
OWNER I.D. No. - N-26
LOCATION - NEW RIVER # 1

DATE OF CONSTRUCTION - 1942
GENERAL COMMENTS:
- SOME A.A. CRACKING

AGGREGATE SOURCES:

CEMENT SOURCES:





ADI No. - DOT 31

OWNER I.D. No. - N-26

LOCATION - NEW RIVER # 1

DATE OF CONSTRUCTION - 1942

GENERAL COMMENTS:

- SOME A.A. CRACKING IN ARCH

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 32

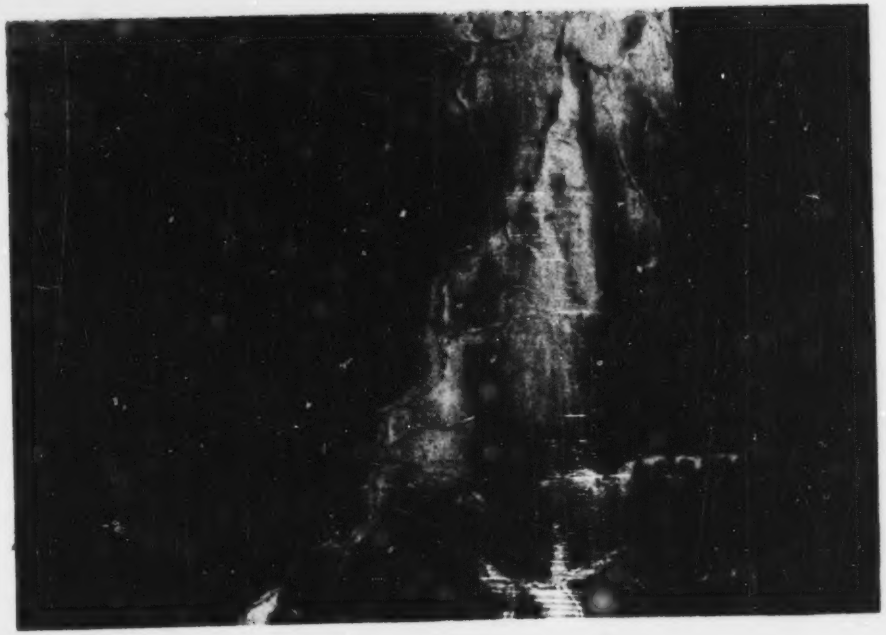
Owner I.D. No. - N-26 A

Location - New River
Old Bridge Abutments

Date of Construction - 1904

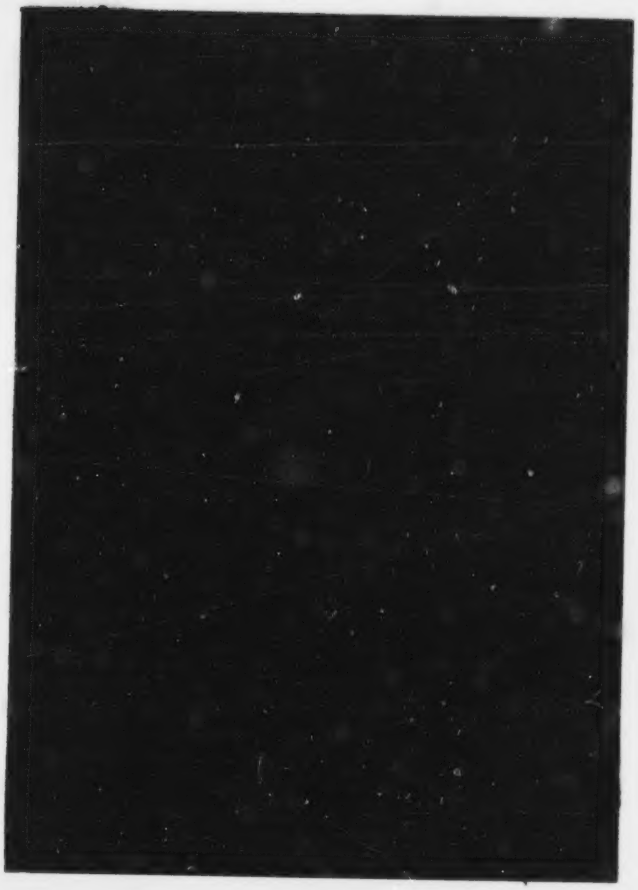
General Comments:

- Extensive A.A. Reaction & Cracking



Aggregate Sources:

Cement Sources:



ADI No. - DOT 32

OWNER I.D. No. - N-26A

LOCATION - NEW RIVER
OLD BIDGE ABUTMENTS

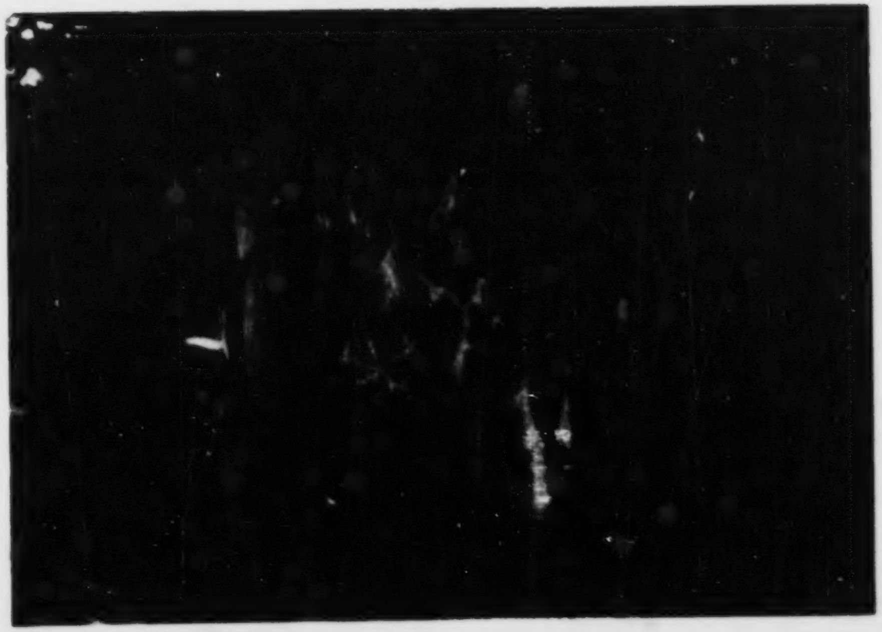
DATE OF CONSTRUCTION - 1904

GENERAL COMMENTS:

-

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DOT 33

Owner I.D. No. - R18

Location - Renous River

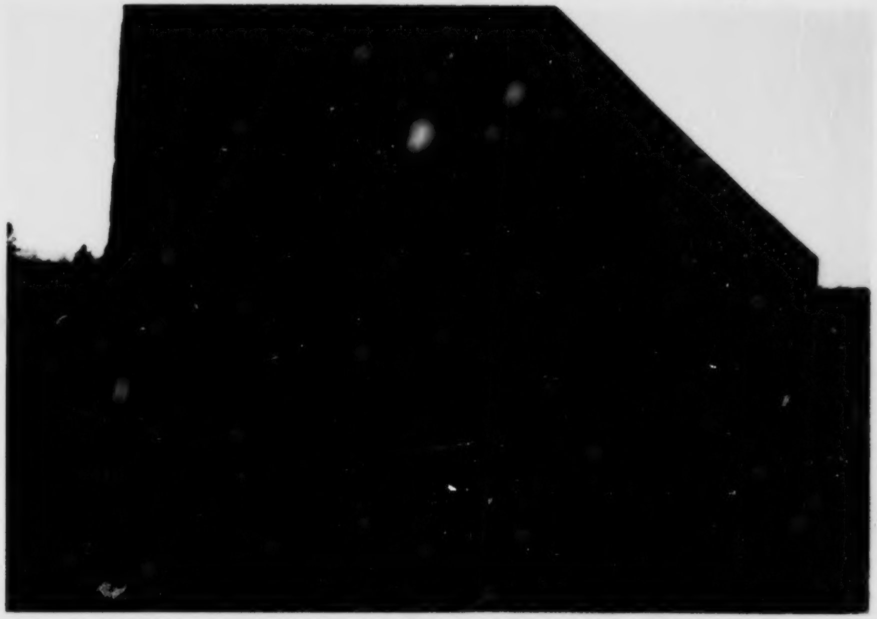
Date of construction - 1971

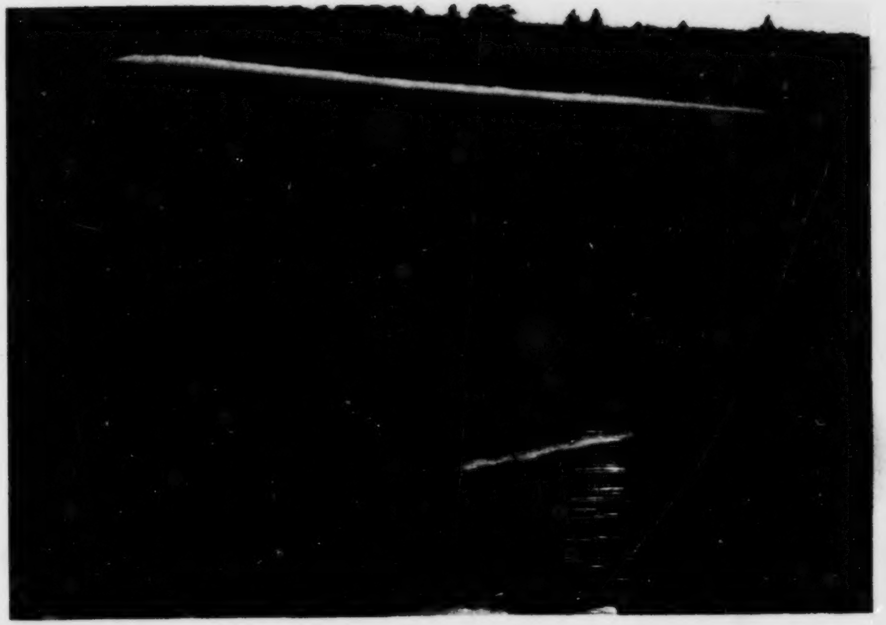
General comments:

- Pattern cracking on end posts, wing walls, breast wall, pier tops
- Under side deck O.K.

Aggregate sources:

Cement sources:





ADI No. - DOT 34

OWNER I.D. No. - S-67

LOCATION - QUARRYVILLE MAIN RIVER

DATE OF CONSTRUCTION - 1912

GENERAL COMMENTS:

- ABUTMENT GENERALLY OK
- PIERS ARE ERODED BUT VERY LITTLE LEACHING

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DOT 35

Owner I.D. No. - T-04

Location - TABUSINTAC RIVER # 1

Date of construction - 1970

General comments:

- U/S DECK & ABUTMENT LOOK O.K. BUT END POSTS BADLY CRACKED AND LEACHING SOME
- ALSO TRACES ON S/W, JOINTS LOOK TIGHT.

Aggregate sources:

Cement sources:

ADI No. - DOT 36

Owner I.D. No. - S-55

Location - South Pokemouche

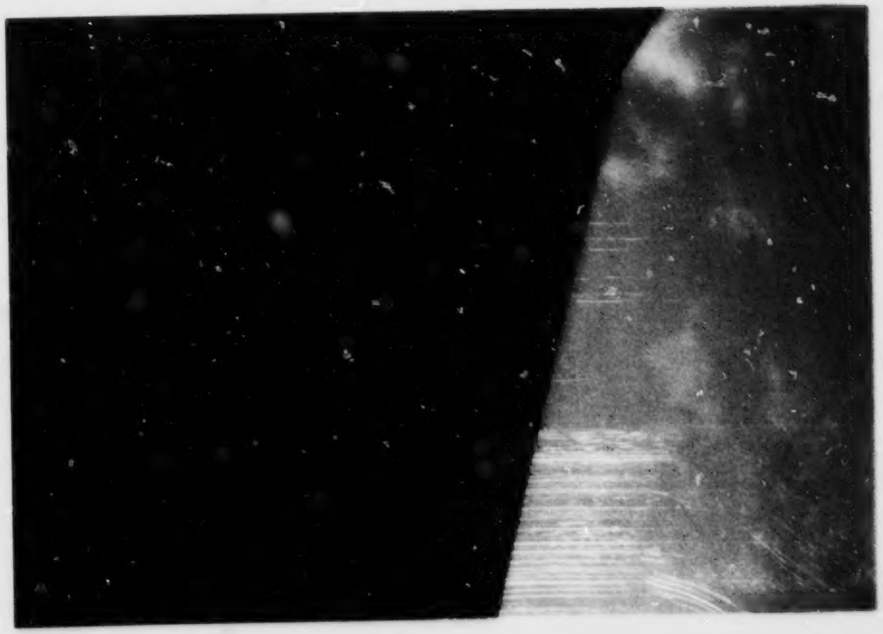
Date of construction - 1958

General comments:

- Guard rail good, joints appear tight, pattern cracks and leaching U/S side, less on D/S

Aggregate sources:

Cement sources:



ADI No. - DOT 37
OWNER I.D. No. - G-68
LOCATION - GORGE ROAD OVERHEAD

DATE OF CONSTRUCTION - 1959
GENERAL COMMENTS:
- SIGNIFICANT CRACKS

AGGREGATE SOURCES:

CEMENT SOURCES:

EAST ABUTMENT SOUTH END

EAST ABUTMENT CENTRE

- EAST ABUTMENT NORTH END

- WEST ABUTMENT CENTRE

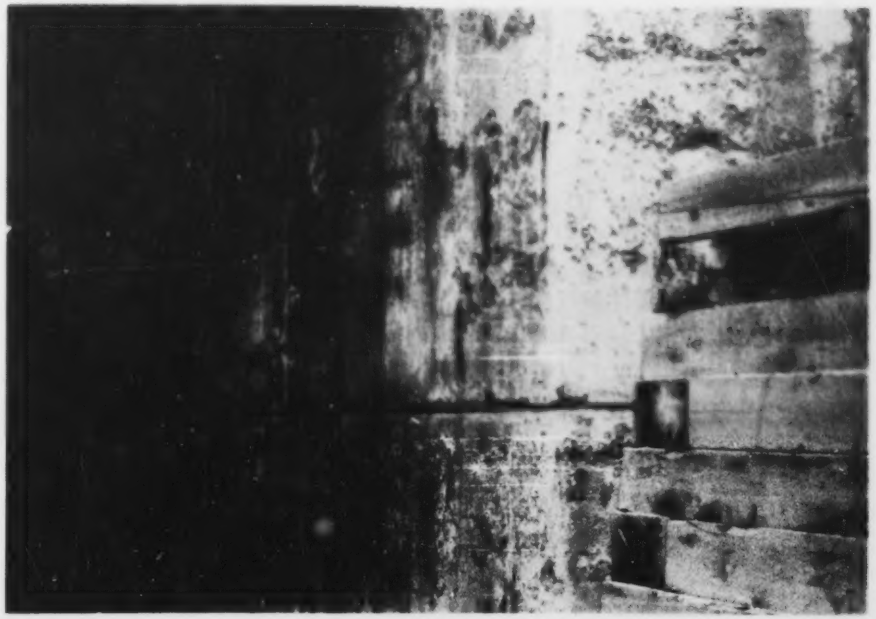
ADI No. - DOT 37

OWNER I.D. No. - G-68

LOCATION - GORGE ROAD OVERHEAD

DATE OF CONSTRUCTION - 1959

GENERAL COMMENTS:



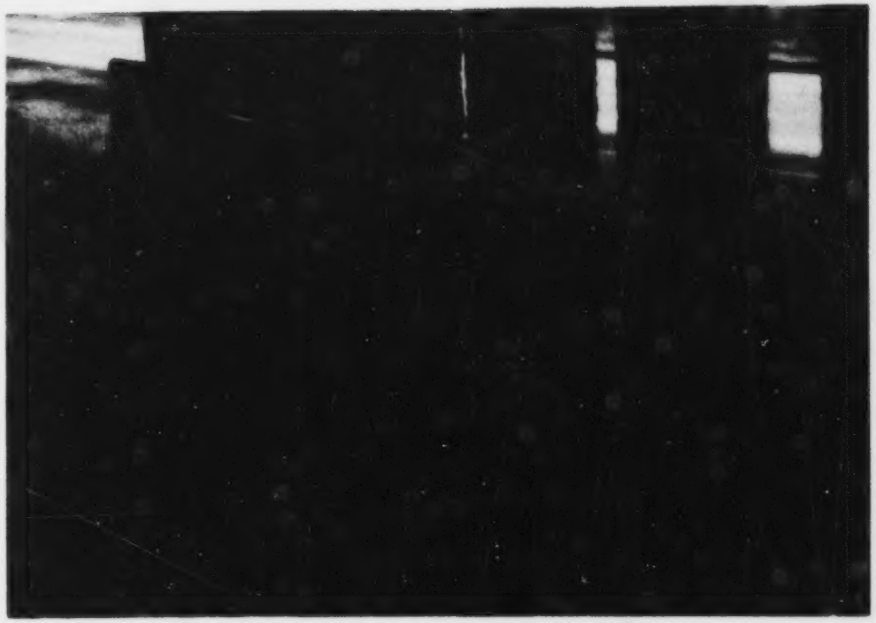
- WEST ABUTMENT NORTH END
- SOME SCALING, NO CRACKS

AGGREGATE SOURCES:

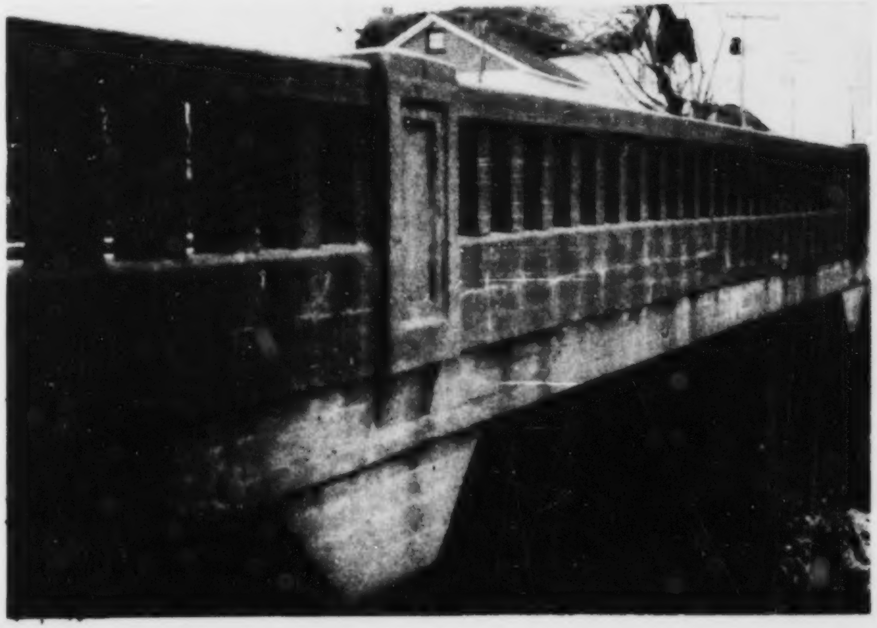
CEMENT SOURCES:

ADI No. - DOT 38
OWNER I.D. No. - H-70
LOCATION - HUMPHREY BROOK #2

DATE OF CONSTRUCTION - 1952
GENERAL COMMENTS:



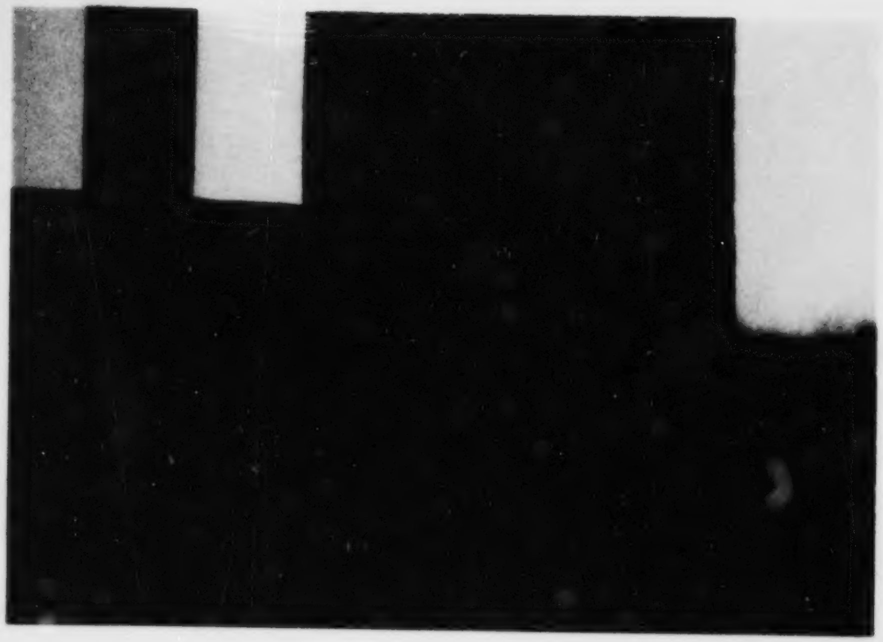
- EAST ABUTMENT, NORTH SIDE



- CENTRE NORTH SIDE

AGGREGATE SOURCES:

CEMENT SOURCES:



· EAST ABUTMENT, SOUTH SIDE

ADI No. - DOT 39

OWNER I.D. No. - C-90

LOCATION - CRANK BROOK # 1

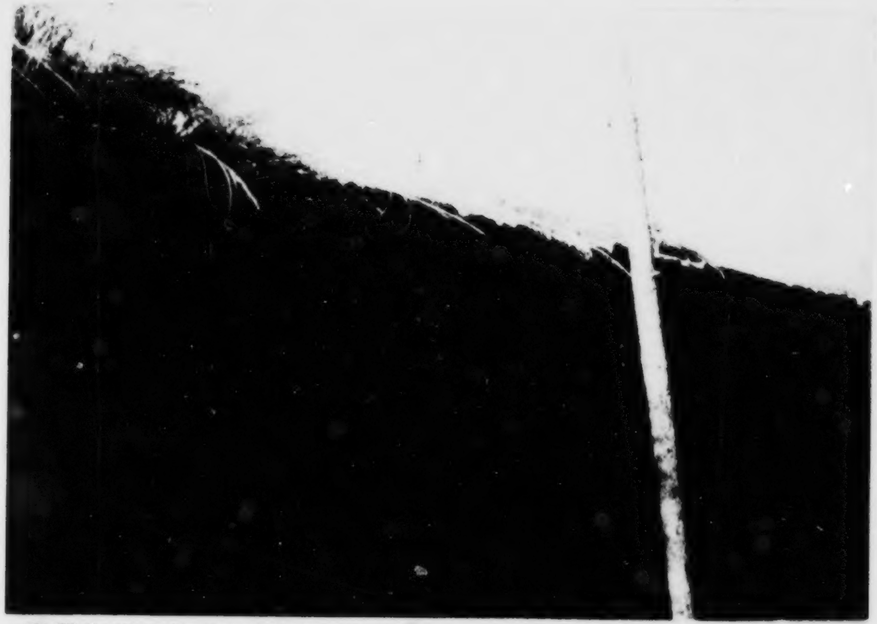
DATE OF CONSTRUCTION - 1949

GENERAL COMMENTS:

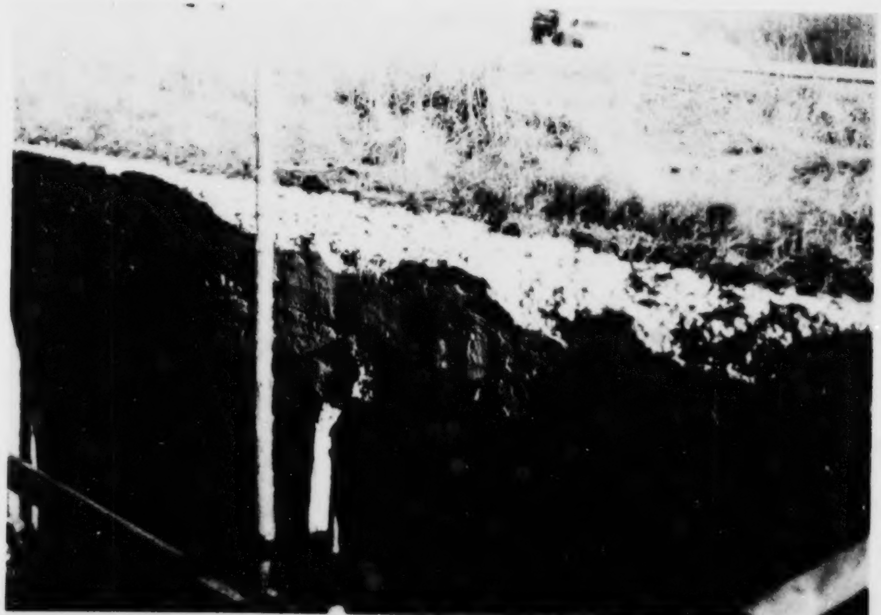
- SIGNIFICANT DISINTEGRATION NEAR TOP

AGGREGATE SOURCES:

CEMENT SOURCES:



-BEAM SOUTH SIDE



-BEAM NORTH SIDE NEAR CENTRE

WEST ABUTMENT SOUTH SIDE.

ADI No. - DOT 40

Owner I.D. No. - G-08

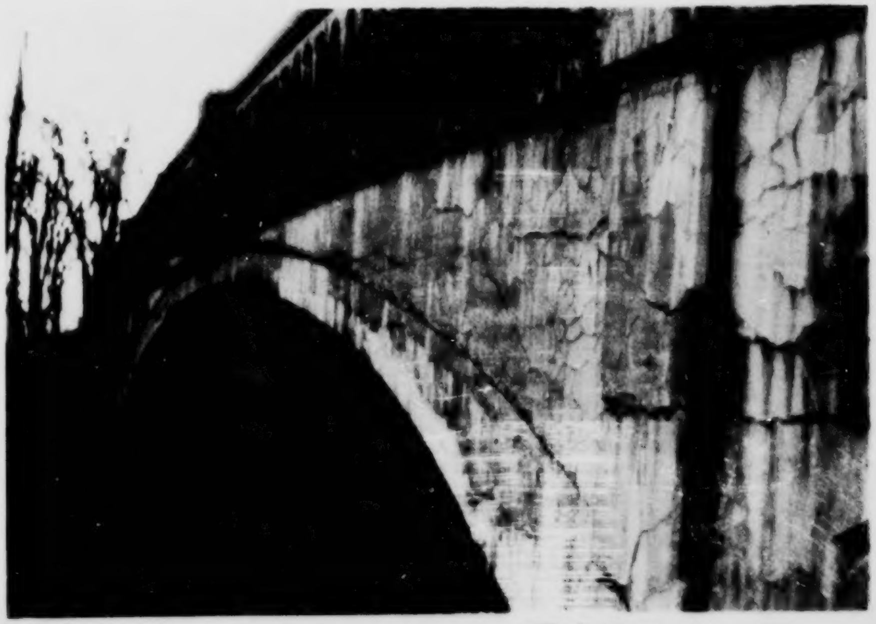
Location - Gaspereau River #1

Date of construction - 1934

General comments:

- Entire structure in bad condition

- South side east abutment

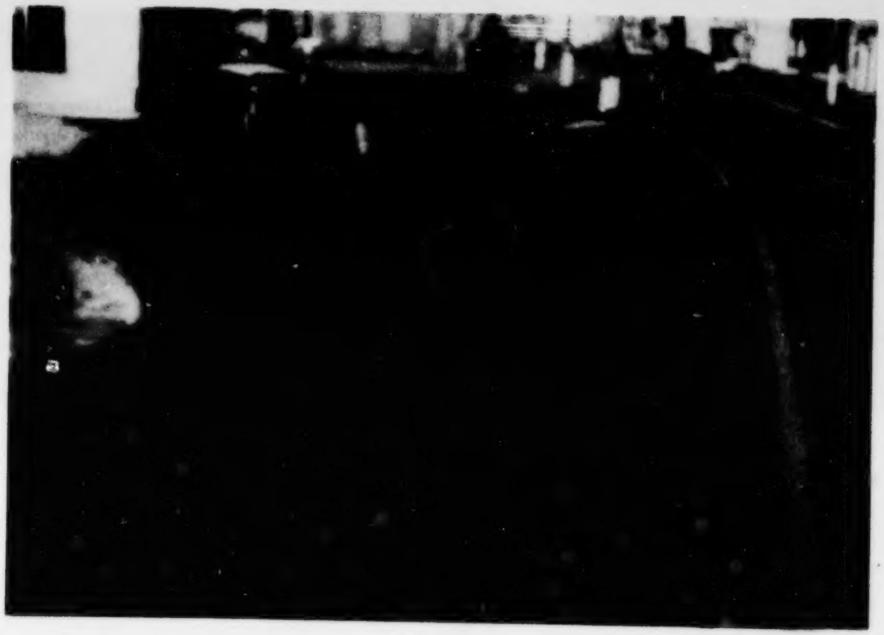


- South side from east end

Aggregate sources:

Cement sources:

-SOUTH SIDE RAILING NEAR EAST END



-NORTH SIDE RAILING AT CENTRE

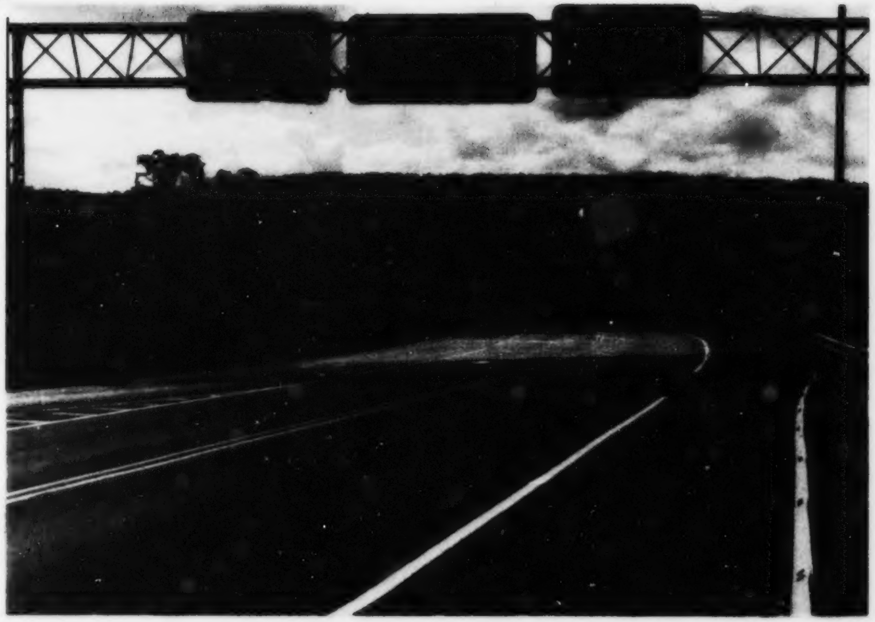
ADI No. - DOT 41

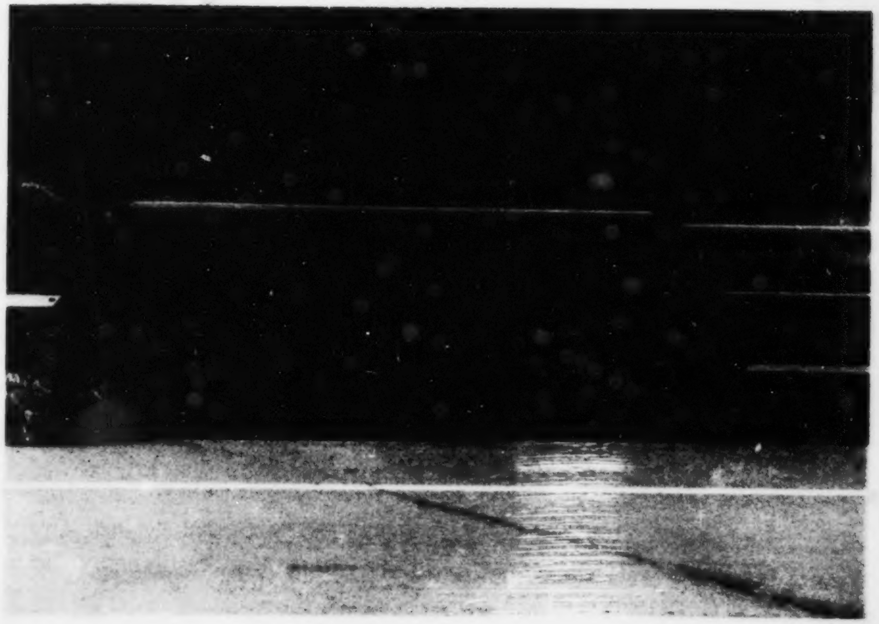
Owner I.D. No. - K-38

Location - Kennebecasis River #1

Date of construction - 1968

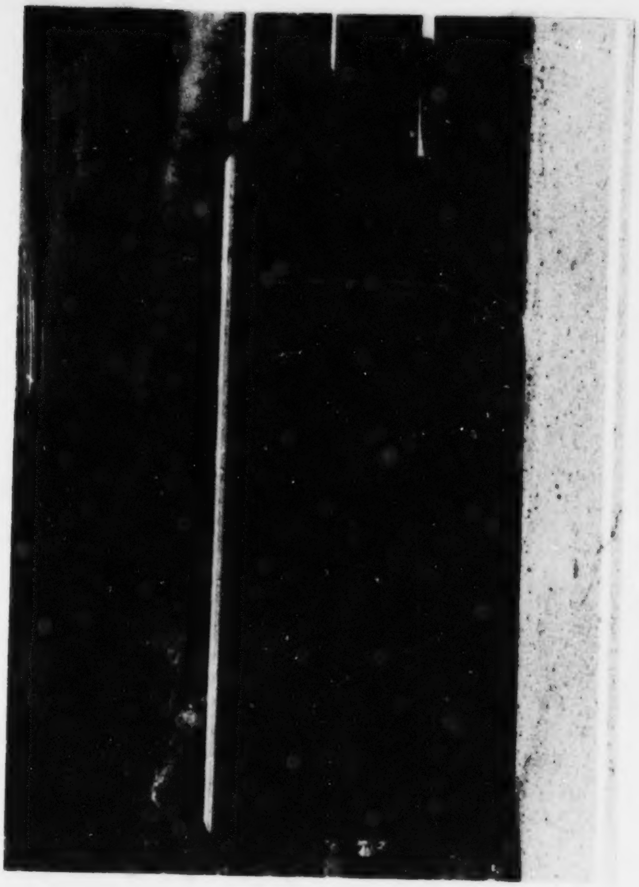
General comments:





Aggregate sources:

Cement sources:



ADI No. - DOT 42
OWNER I.D. No. - D32 A
LOCATION - DENNIS STREAM # 2

DATE OF CONSTRUCTION - 1921
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - CNR 1

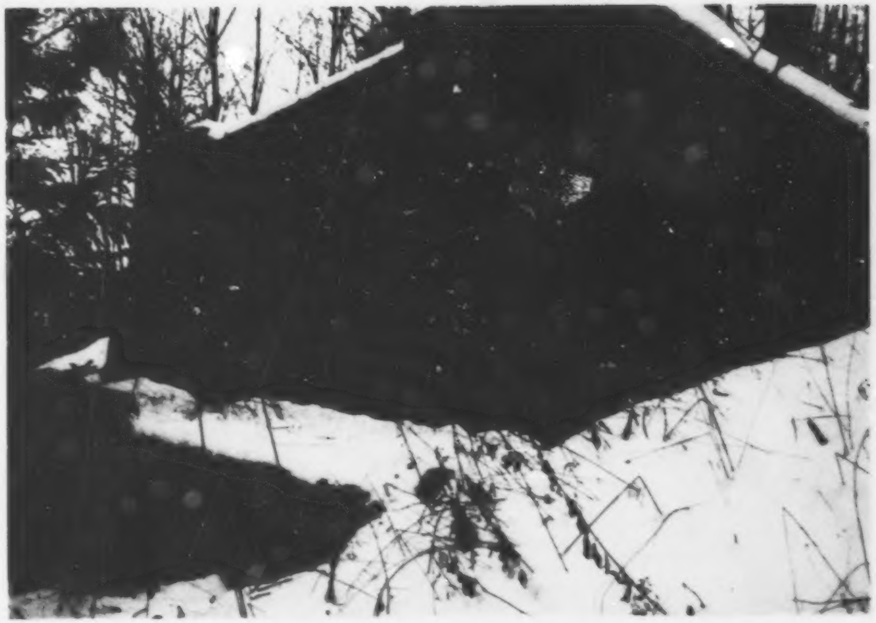
Owner I.D. No. -

Location - SHOGOMOC RIVER

Date of construction - 1913

General comments:

- OLD CP/CN ABUTMENT
- VERY GOOD CONDITION



Aggregate sources:

Cement sources:

ADI No. - CNR 2

Owner I.D. No. -

Location - MADAWASKA RIVER
NEAR DOT M12.

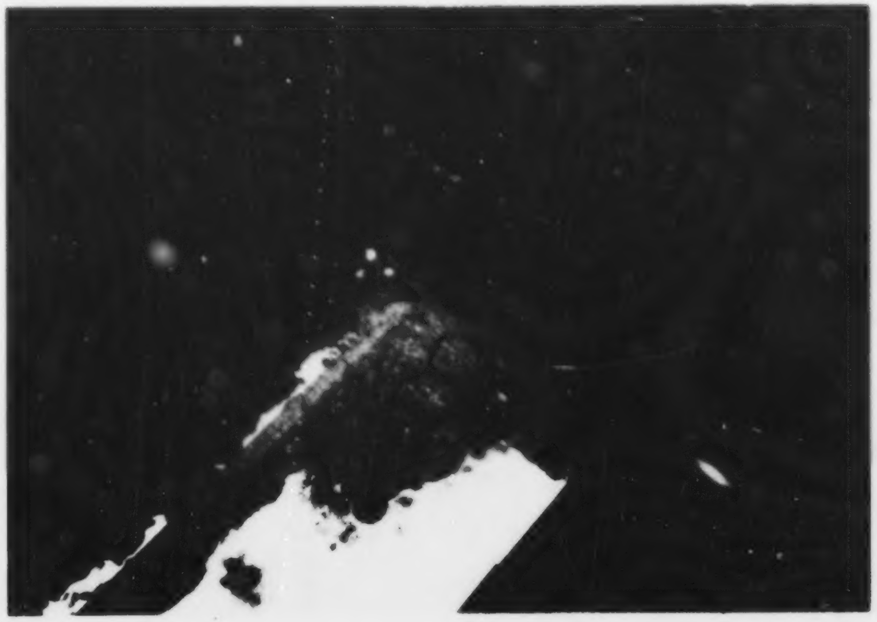
Date of construction - 1953

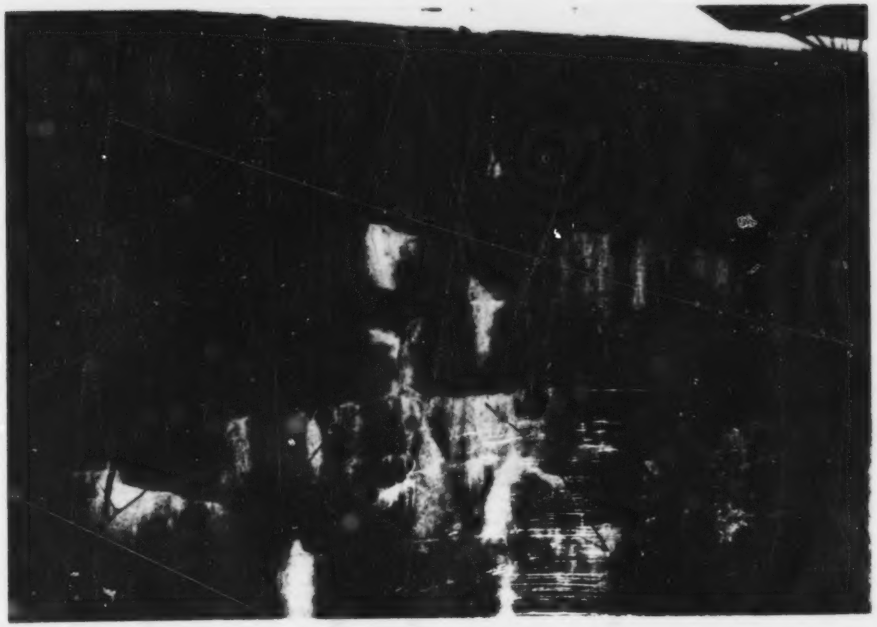
General comments:

- CENTRE PIER HAS A LOT OF PATTERN CRACKING, ALSO WEST ABUT.
- FACE OF ABUTMENT DOESN'T LOOK TOO BAD EXCEPT AT EDGES

Aggregate sources:

Cement sources:





ADI No. - CNR 3

OWNER I.D. No. - 208-5

LOCATION - GREEN RIVER

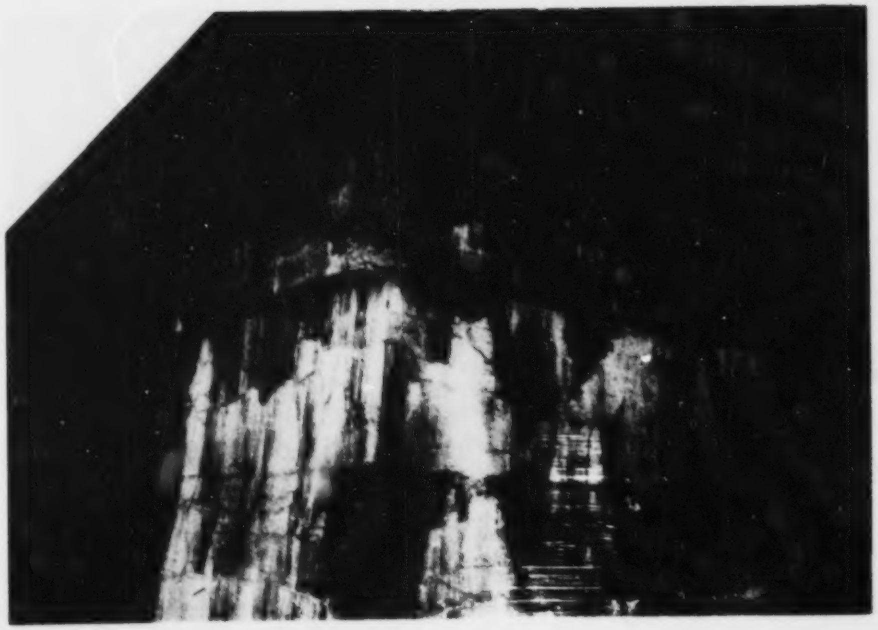
DATE OF CONSTRUCTION -

GENERAL COMMENTS:

- S. PIER LOOKS LIKE A CLASSIC CASE OF A.S.R.
- OTHER PIER LOOKS BETTER

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - CNR 4

OWNER I.D. No. - (J 75)

LOCATION - JONES CROSSING
CNR OVERHEAD RTE 8

DATE OF CONSTRUCTION - 1952.

GENERAL COMMENTS:

- SEVERE PATTERN CRACKING S.W. WALL
- EAST SIDE O.K.
- U/S DECK LEACHING

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - CN 5

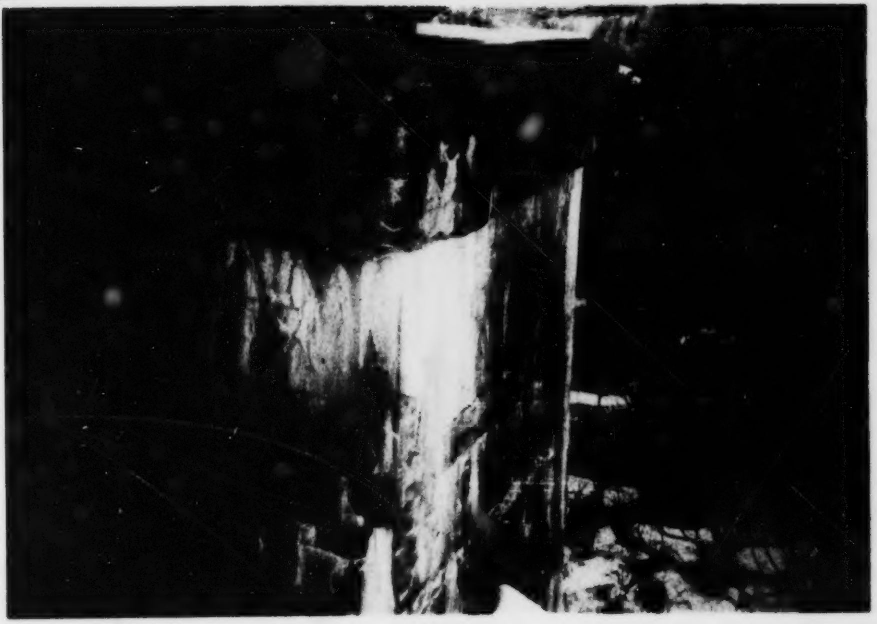
OWNER I.D. No. - ADJ. TO DOT S·67

LOCATION - S.W. MIRAMICHI @ QUARRYVILLE

DATE OF CONSTRUCTION - 1945

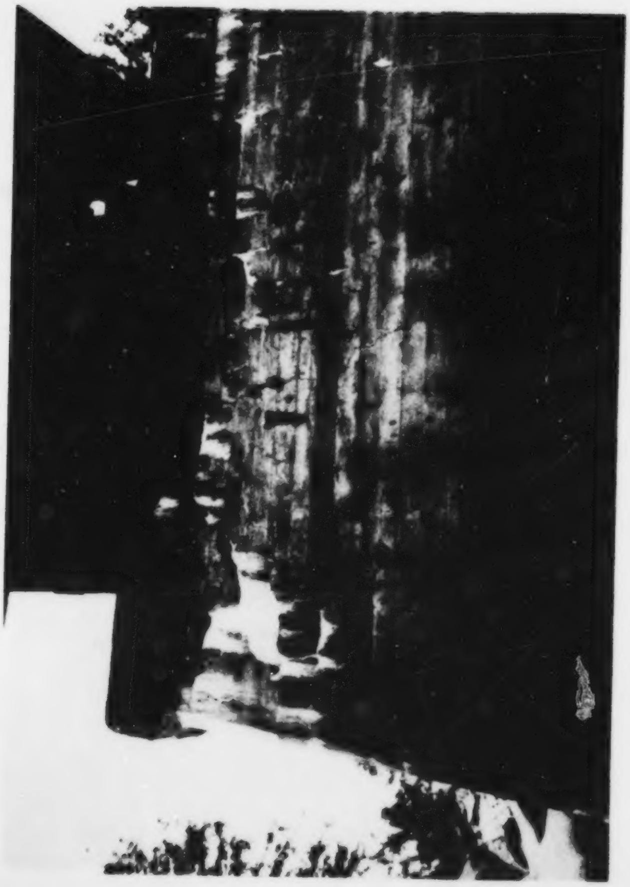
GENERAL COMMENTS:

- PIER SHOWS SEVERE CRACKING & LEACHING
- ABT. OTHER SIDE LOOKS OLDER
- SHOWS LESS PATTERN CRACKS
- REMAINS OF OLDER WING WALL



AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - NBP 1

OWNER I.D. No. -

LOCATION - OLD GRAND FALLS
MONUMENT

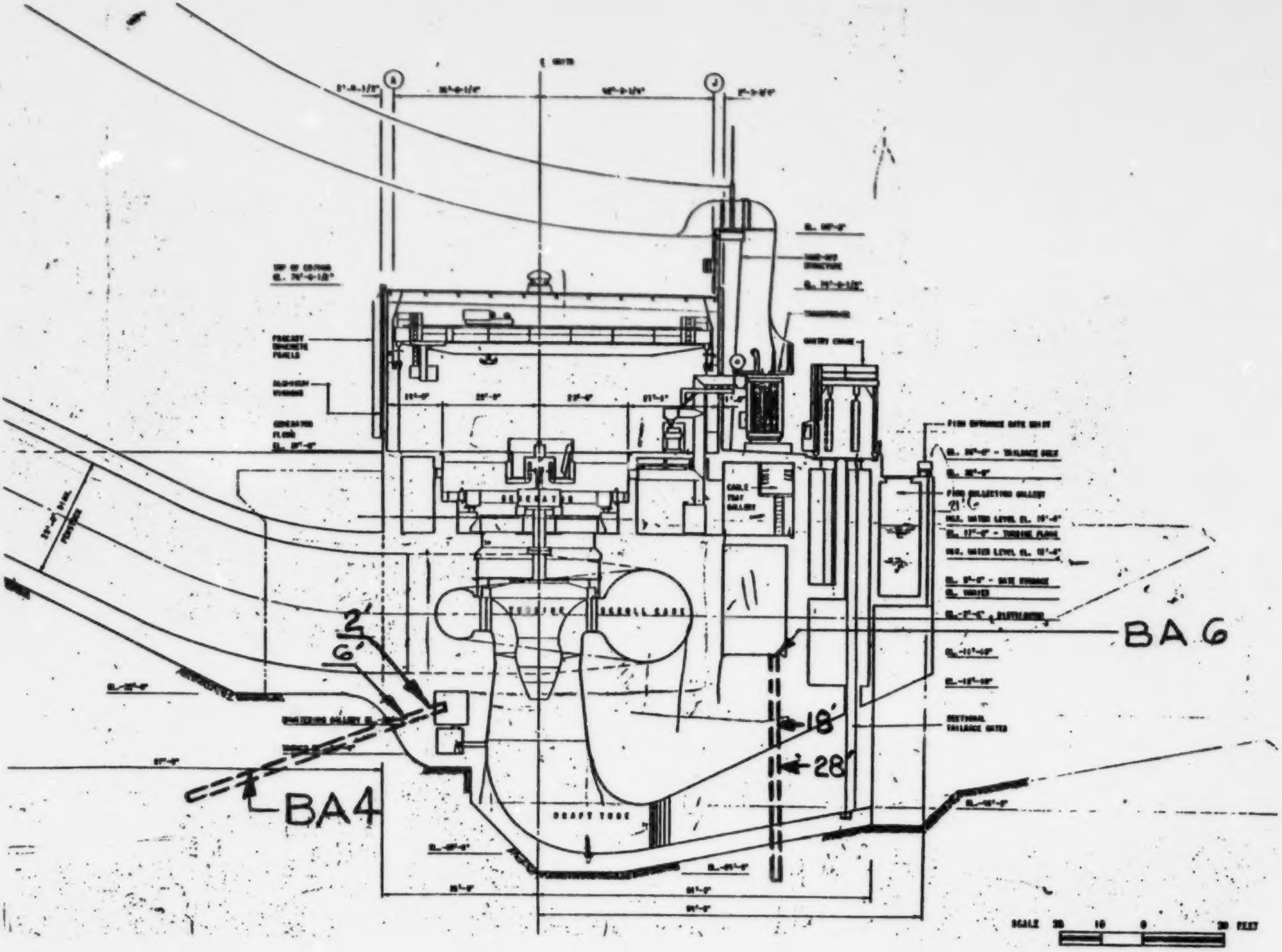
DATE OF CONSTRUCTION - 1928 ±

GENERAL COMMENTS:

- FAIRLY SEVERE CRACKING

AGGREGATE SOURCES:

CEMENT SOURCES:


FISH ENTRANCE GATE HOIST
FISH COLLECTION GALLERY
21'6
TURBINE FLOOR
BA 6
SECTIONAL TAILRACE GATES
18'
28'
2'
6'
BA4
DRAFT TUBE
SCALE
FEET

NBP 2

MACTAQUAC DAM
1965-68

ADI No. - NBP 3

OWNER I.D. No. -

LOCATION - EAST MUSQUASH DAM

DATE OF CONSTRUCTION - 1921

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - NBP 3

Owner I.D. No. -

Location - East Musquash Dam

Date of construction - 1921

General comments:

Aggregate sources:

Cement sources:

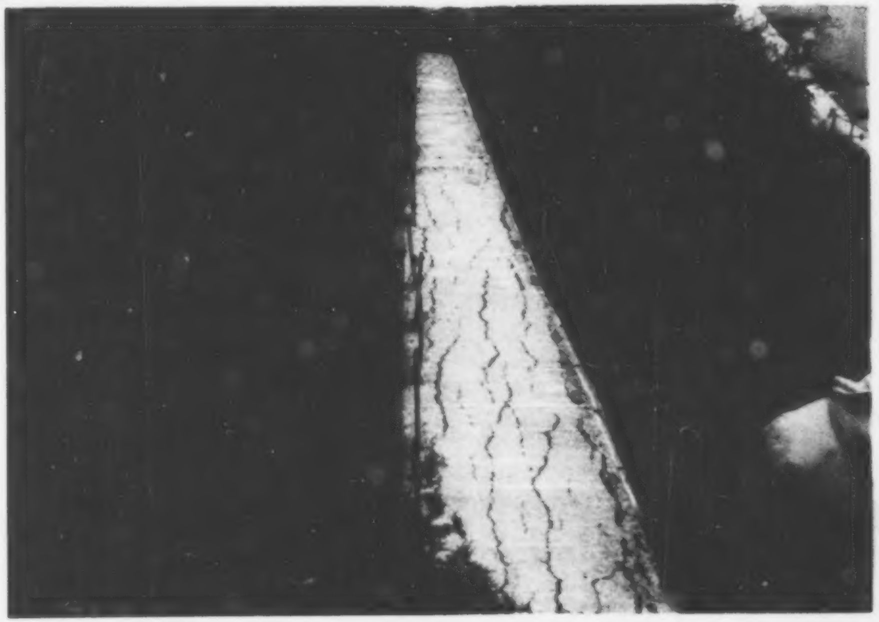
ADI No. - NBP 4

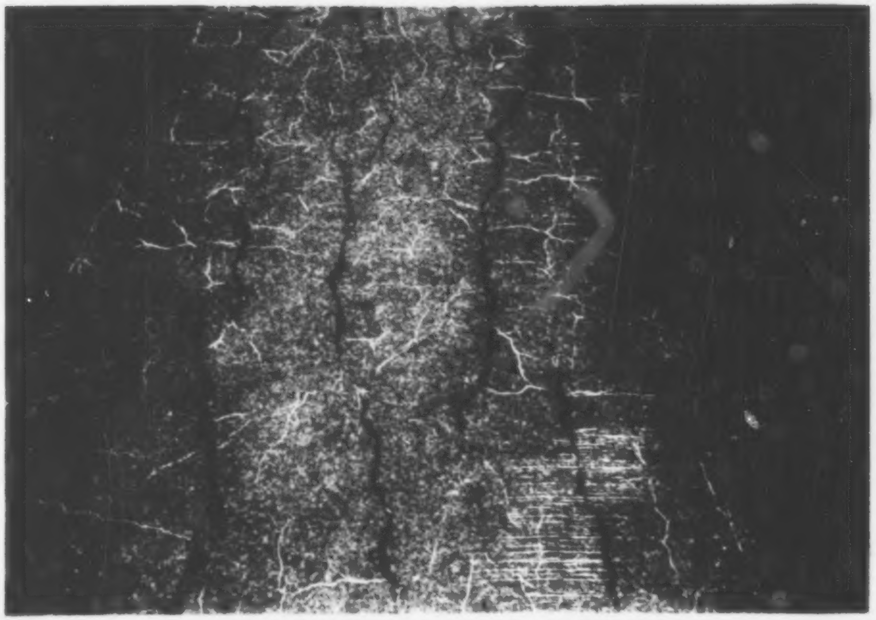
Owner I.D. No. -

Location - West Musquash Dam

Date of construction - 1921

General comments:





Aggregate sources:

Cement sources:

PENSTOCK THRUST BLOCK

ADI No. - PWC 1
OWNER I.D. No. -
LOCATION - JEMSEG WHARF

DATE OF CONSTRUCTION -
GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - PWC 2

OWNER I.D. No. -

LOCATION - EDMUNDSTON - MADAWASKA
(INTERNATIONAL BRIDGE)

DATE OF CONSTRUCTION - 1921

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:

ADI No. - DD 1

Owner I.D. No. -

Location - Saint John Dry Dock

Date of construction -

General comments:

Aggregate sources:

Cement sources:

ADI No. - DD 1

OWNER I.D. No. -

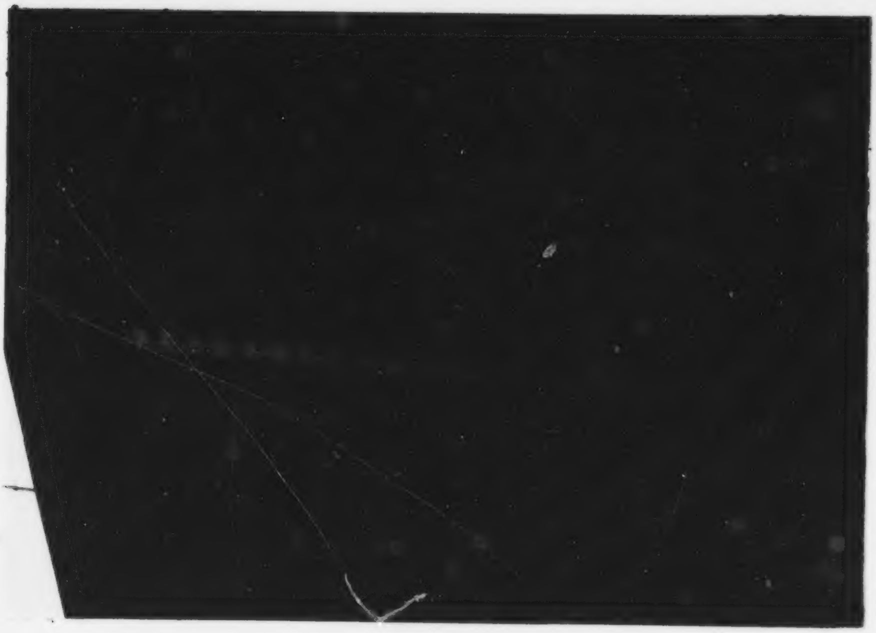
LOCATION - SAINT JOHN DRY DOCK

DATE OF CONSTRUCTION -

GENERAL COMMENTS:

AGGREGATE SOURCES:

CEMENT SOURCES:



ADI No. - DD 1

Owner I.D. No. -

Location - Saint John Dry Dock

Date of construction -

General comments:

Aggregate sources:

Cement sources:

CONTRACT SERIAL NUMBER 0SQ85-00187
CONTRACTOR: ADI LIMITED
DSS REQUISITION NUMBER 23440-4-9236
APPENDIX C

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX C

RECORD OF CONCRETE SAMPLED

15 pp

MICROMEDIA

STUDY OF THE ALKALI-REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX C

RECORD OF CONCRETE SAMPLED

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DOT 6	S-46
DOT 7	M-12
DOT 8	R-09
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DOT 10	P-57
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Study I.D. No.	Owner I.D. No.
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DOT 38	H-70
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DOT 40	G-08
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NBP 1	--
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PWC 1	--
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CONCRETE SAMPLE DESCRIPTIONS

DOT 1
P-17 - Parsons Brook #2
Location - Wingwall
Sussex, NB

0-100mm	Significant cracks in paste and aggregate major crack perpendicular to c/a at 100.
100-325mm	Some cracking in aggregate particles. Some aggregates have the appearance of material having been leached. Fractures show white deposits. Aggregate is natural gravel 40mm max size.

DOT 2
P-15 - Parsons Brook # 1
Location - End Abutment
Sussex, NB

0-228	Concrete appears sound and in good condition. Aggregate is natural gravel, 50mm max size.

DOT 3
T-74 - Trout Creek # 2
Location - West Pier
Sussex, NB

0-300	Concrete in relatively good condition. A number of aggregate particles are cracked and have the appearance that material has leached out. Core fracture appears whitish. Aggregate is natural gravel.

DOT 4
D-52 - Deforest Overhead
Location - End Post (East end, South side)
Sussex, NB

0-188	Concrete condition fair, major cracks perpendicular c/a at 75, 150, crack parallel c/a 0-50. Some aggregate particles show cracks which have the appearance that material has been leached out. Some whitish deposits. Aggregate is gravel, 50mm max size.

DOT 5
E 22-A - Old Meductic Bridge Meductic, NB
Location - Abutment

0-50	Fair condition
50-300	Badly broken, poor
300-500	Fair - good

Aggregate is natural gravel 25mm max size aggregate particles show rims, cracks show whitish deposits.

DOT 6
S-46 - Shogomoc Highway Bridge Pokiok, NB
Location - Deck (outside edge)

0-338	Concrete appears to be in good condition, aggregate is a crushed rock, appears to be from the Springhill quarry near Fredericton. Max aggregate size 12.5mm.

DOT 7
M-12 - Madawaska River Bridge (TCH) near Edmundston, NB
Location - Abutment (East side)

0-312	Concrete in good condition. A few aggregate particles show partial cracks. Aggregate is a natural gravel max size 30mm. Minor crack 0-70mm parallel to core.

DOT 8
R-09 - Old # 2 Rapid de Femme Bridge near Grand Falls, NB
Location - Wingwall D/S

0-340	Concrete condition appears sound. Aggregate is natural gravel with 50-75mm max size.

DOT 9
H-26 - Hanson Gulch Bridge near Perth-Andover, NB
Location - End post

0-300	Condition fair. Minor cracking perpendicular c/a 75, 131, 150, 225 and 50 - 225 parallel to core. Aggregate is natural gravel with 75mm max size. Some coarse particles show considerable evidence of cracking.

DOT 10
P-57 - Pisgan Overhead (CNR) Sussex, NB
Location - Rail post

0-75	Condition fair
75-125	Broken Aggregate is natural gravel, max size 50mm. Significant cracks are found in aggregate particles. Whitish deposits on fractures and some rims on aggregates.

DOT 11
N-24 - Nashwaak River Bridge Taymouth, NB
Location - Pier

0-188	Good
188-300	Fair with numerous fractures. Aggregate is natural gravel with max 50mm size. Numerous cracks in aggregate with appearance of material having been leached out. Rims on aggregate. Delamination around periphery of some aggregates.

DOT 12
N-16A - Old Nashwaak River Bridge Fredericton, NB
Location - End Abutment

0-300	Good condition Aggregate is crushed gravel with 25mm max size. No visual evidence of reaction.

DOT 13
R-48 - River George Bridge (1937) Highway No 7 near Welsford, NB
Location - Column

0-275	Condition generally good. White deposit 10mm thick on surface. Aggregate natural gravel 25mm max size. Fractured and shows some whitish deposits and aggregate rims.

DOT 14
R-48A - Rive George Bridge (1920) Highway No 7 near Welsford, NB
Location - Wall

0-270	Condition good Aggregate is natural gravel, possible crushed. Max size 25mm. No evidence of reaction.

DOT 15
Small Bridge Perth (1936) RT 19 - Andover, NB
Location - End wingwall u/s

0-338 Condition good. Aggregate natural gravel with 25mm max size. No evidence of reaction.

DOT 16
B-33 - Bartibog River Bridge # 2 Highway No 8 north of Chatham, NB
Location - End abutment

Chunk sample from abutment. Aggregate is natural gravel. Condition fair - good.

DOT 17
Y-77 York Mills, NB

Chunk sample, condition fair, shows internal cracking in paste.

DOT 18
M-16 Magaguadavic River Bridge
Location - Chunk sample

Aggregate natural gravel appears quite fine. Condition fair - good.

DOT 19
B-90 - Brookville Overhead near Saint John, NB
Location - Deck, Columns, Footings

Condition poor. Fractures show white deposits, aggregate rims. Considerable evidence of aggregate reaction. Some aggregates show fractures. Aggregate is natural gravel.

DOT 20
B-60 - Blair Overhead near Saint John, NB
Location - Deck

Concrete is badly fractured. Fractures show white deposits, aggregate rims. Some fracturing in aggregates. Aggregate is natural gravel.

DOT 21
H-28 - Hailes Brook # 7
Location - End abutment
RTE 17 near Kedgwick, NB

0-338 Good condition. Natural gravel aggregate max size 20mm. Slight traces of rims on some aggregate particles.

DOT 22
B-43 - Big Forks Brook
Location - North Wingwall
RTE 17 near St Leonard, NB

0-306 Generally good condition. Crack parallel to core to 10mm. Aggregate is natural gravel generally quite fine. Some traces of aggregate rimming. Some whitish deposits in voids.

DOT 23
T-20 - Teaques Brook
Location - Abutment D/S
RTE 11 east of Bathurst, NB

0-438 Condition generally good. Crack perpendicular c/a at 175. Natural gravel aggregate max size 40mm. There are some minor white deposits in voids and rims on some aggregate particles.

DOT 24
B-35 - Benjamin River # 1
Location - End abutment
RTE 11 near Dalhousie, NB

0-338 Good condition. Natural aggregate max size 40mm. Some minor fractures in aggregate particles.

DOT 25
L-68 - Louison River #1
Location - End abutment
RTE 11 near Dalhousie, NB

0-312 Concrete fair to good. Major crack at 188 mm perpendicular c/a. Aggregate natural gravel max size 25mm. Some coarse aggregate particles exhibit fractures.

DOT 26
C-40 - Christopher Brook # 1 RTE 17 near Campbellton, NB
Location - Wingwall

0-338	Concrete in good condition large stone 90mm at end. Natural gravel max size 40mm. No evidence of reaction.

DOT 27
W-26 - Nerepis Overpass near Saint John, NB
Location - Deck

Chunk sample.
Fracture surfaces show whitish deposits, aggregate rims. Aggregate is natural gravel max size 25mm.

DOT 28
F-20 - Ferguson Brook near Saint John, NB
Location - Wingwall

0-300	Concrete appears sound. Natural gravel max size 45mm some aggregate particles show rims and fractures. Traces of whitish deposits on fractures.

DOT 29
L-84 - Lorneville Road Overpass near Saint John, NB
Location - End post

0-262	Concrete sound except for major crack perpendicular c/a at 150mm. Aggregate crushed gravel MSA 40mm. No visual evidence of reaction.

DOT 30
H-27 - Hanson Stream # 2 near Lepreau, NB
Location - Column footing

0-300	Concrete appears sound. Aggregate is crushed gravel MSA 40mm. Slight evidence of reactivity, whitish deposits.

DOT 31
N-26 - New River # 1 near Lepreau, NB
Location - East abutment footing

0-275 Concrete condition fair. 0-60 crack with whitish deposits parallel c/a. Major crack perpendicular c/a 112mm. Natural gravel aggregate MSA 40mm. Considerable internal cracking in matrix aggregates, appearance of material having been leached out.

DOT 32
N-26A - New River # 1 (old structure) near Lepreau, NB
Location - East abutment

0-300 Concrete fair to poor condition 0-125 large surface cracks 125 - 300 badly broken. Natural gravel aggregate MSA 75mm. Extensive internal cracking in aggregates, appearance of material having been leach out.

DOT 33
R-18 - Renous River Renous, NB
Location - End post

0-282 Concrete in good condition. Aggregate is crushed stone probably from Springhill, NB. No visual signs of reaction although end post has extensive pattern cracking.

DOT 34
S-57 - Quarryville Quarryville, NB
Location - Abutment

0-344 Concrete in good condition aggregate is natural gravel MSA 40mm. No evidence of reactivity.

DOT 35
T-04 - Tabusintac River # 1 Tabusintac, NB
Location - End posts one good one pattern cracked

No 1 good end post 0-250 concrete in good condition aggregate is crushed gravel MSA 40mm. No evidence of reaction.

No 2 cracked end post 0-290 concrete in good condition aggregate is crushed rock probably from Springhill, NB

DOT 36
S-55 South Pokemouche
Location - End abutment

0-262 Concrete in good condition occasional crack in aggregate particle. Aggregate is gravel MSA 40mm.

DOT 37
G-68 - Gorge Road Overhead near Moncton, NB
Location - West abutment

0-338 Concrete in good condition aggregate is crushed rock no evidence of reaction.

DOT 38
H-70 - Humphrey Brook # 1 near Moncton, NB
Location - End wingwall

0-275 Concrete in poor to fair condition. Major cracks perpendicular c/a at 75, 150mm fairly extensive internal cracking in paste and aggregate. Some reaction rims. Aggregate is gravel MSA 50mm.

DOT 39
C-90 - Crank Brook # 1 near Fundy Park
Location - End abutment

0-228 Concrete generally good. Some possible reaction rims on aggregates and some minor internal cracking in aggregates. Aggregate is gravel MSA 40mm.

DOT 40
G-08 - Gaspereau River # 1 Port Elgin, NB
Location - Side wall east abutment

0-488 Concrete in poor condition major cracks perpendicular c/a 50, 160, 228, minor cracks perpendicular c/a 44, 138, 160, 200. Extensive cracking in coarse aggregate, aggregate rims aggregate is gravel MSA 50mm.

DOT 41
K-38 - Kennebecasis River # 1
Location - End post Sussex, NB

0-212 Concrete in sound condition. No visual evidence of reaction. Aggregate appears to be crushed rock.

DOT 42
D-32A - Dennis Stream # 2
Location - End of side wall w/s near St Stephen, NB

0-325 Concrete in relatively good condition. 0-40mm surface crack. 75mm minor crack. 125 and 328mm major cracks perpendicular c/a. Minor aggregate rims and fractures. Aggregate is natural gravel MSA 25mm.

CNR 1
Shogomoc River
Location - Abutment
near Pokiok, NB

0-312 Concrete generally sound condition. Aggregate is gravel MSA 30mm. No evidence of reaction.

CNR 2
Madawaska River (near M-12)
Location - Abutment
near Edmundston, NB

0-338 Concrete in fair to good condition. Minor cracking at 25, 40, 50mm. Whitish deposits on surface. Some internal cracking in coarse aggregate which is a natural gravel MSA 25mm.

CNR 3
208.5 Green River
Location - Abutment
Green River, NB

0-312 Reasonably sound concrete, major crack perpendicular c/a at 60mm. Some evidence of aggregate rims minor internal cracks. Whitish deposits on fractures. Aggregate is gravel MSA 15mm.

CNR 4
J-75 Jones Crossing Overhead
Location - Wingwall
Newcastle, NB

0-338 Concrete generally good condition. Some rims on coarse aggregate particles. Aggregate natural gravel MSA 40mm.

CNR 5
Quarryville
Location - Pier
Quarryville, NB

0-406 Fair to good condition. Major crack perpendicular c/a 238mm. Evidence of reaction rims on coarse aggregate, occasional aggregates have internal cracks. Aggregate is natural gravel MSA 40mm.

NBP 1
Old Grand Falls Monument
Location - South Face Grand Falls, NB

0-280 Concrete condition fair. Major cracks perpendicular c/a. Whitish deposits on fractures. Rims on coarse aggregate. Internal fractures in paste and aggregate. Aggregate is natural gravel.

NBP 2
Mactaquac Dam
Location - various location in powerhouse near Fredericton, NB

All core is sound, some appear to be relatively porous. No internal cracking or aggregate rims in evidence. Aggregate is crushed rock, sediments, greywackes etc. Sand natural sand from Zealand, NB.

NBP 3
East Mushquash Dam
Location - Top of main dam (buttress) near Saint John, NB

0-500 Concrete generally badly broken and cracked throughout, althought there is in an improvement with depth. aggregate is natural gravel MSA 60mm. Aggregate shows internal cracking, rims whitish deposits.

NBP 3
East Mushquash Dam
Location - Old wall west of main dam near Saint John, NB

0-400 Concrete condition is sound but the material appears porous. Aggregate is natural gravel MSA 40mm. No evidence of reactions.

NBP 4
West Mushquash Dam
Location - Top of Dam near Saint John, NB

0-375 Concrete quality generally poor, badly broken to 125mm. Major cracks at 188 and 288mm. Natural gravel aggregate MSA 60mm. Some internal cracking in paste and aggregate traces of possible reaction rims.

PWC 1
Jemseg Wharf Jemseg, NB
Location - Chunk sample

Condition fair to good. Some whitish deposits and possible aggregate rims.

PWC 2
Edmundston - Madawaska International Bridge Edmundston, NB
Location - Pier

Condition of cores - fair to good, fairly significant cracking, some whitish deposits, possible reaction rims, aggregate is natural gravels.

CONTRACT SERIAL NUMBER 0SQ85-00187
CONTRACTOR: ADI LIMITED
DSS REQUISITION NUMBER 23440-4-9236
APPENDIX F1

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX F1

INVENTORY OF ROCK SAMPLES

82 pp

MICROMEDIA

STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
OF NEW BRUNSWICK

APPENDIX F

RECORD OF BEDROCK SAMPLES AND RPC PETROGRAPHIC STUDIES

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R8	6
R9	4
R10	3
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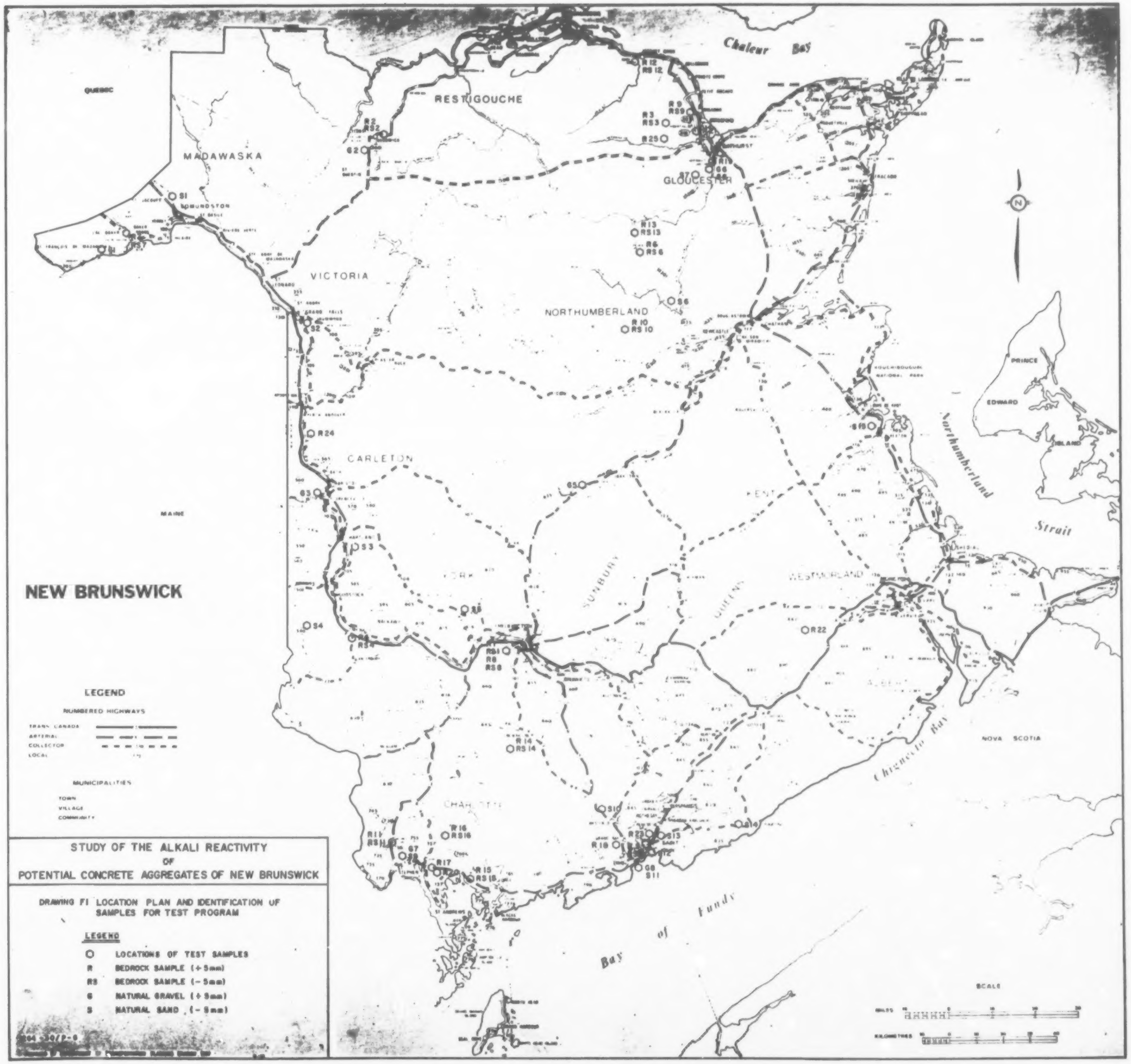
R24	2
R25	3


QUEBEC
Chaleur Bay
RESTIGOUCHE
MADAWASKA
EDMUNDSTON
VICTORIA
GLOUCESTER
NORTHUMBERLAND
CARLETON
KENT
YORK
SUNBURY
QUEENS
WESTMORLAND
ALBERT
CHARLOTTE
MAINE
NEW BRUNSWICK
PRINCE EDWARD ISLAND
NOVA SCOTIA
Northumberland Strait
Chignecto Bay
Bay of Fundy
KOUCHIBOUGUAC NATIONAL PARK
S1
R2
RS2
G2
R12
RS12
R9
RS9
R3
RS3
R25
R1
G6
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R6
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R24
G5
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NUMBERED HIGHWAYS
TRANS CANADA
ARTERIAL
COLLECTOR
LOCAL
MUNICIPALITIES
TOWN
VILLAGE
COMMUNITY
SCALE
MILES
KILOMETRES

STUDY OF THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

DRAWING F1 LOCATION PLAN AND IDENTIFICATION OF
SAMPLES FOR TEST PROGRAM

LEGEND

○	LOCATIONS OF TEST SAMPLES
R	BEDROCK SAMPLE (+ 5mm)
RS	BEDROCK SAMPLE (– 5mm)
G	NATURAL GRAVEL (+ 5mm)
S	NATURAL SAND (– 5mm)

804-30/P-8

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R1

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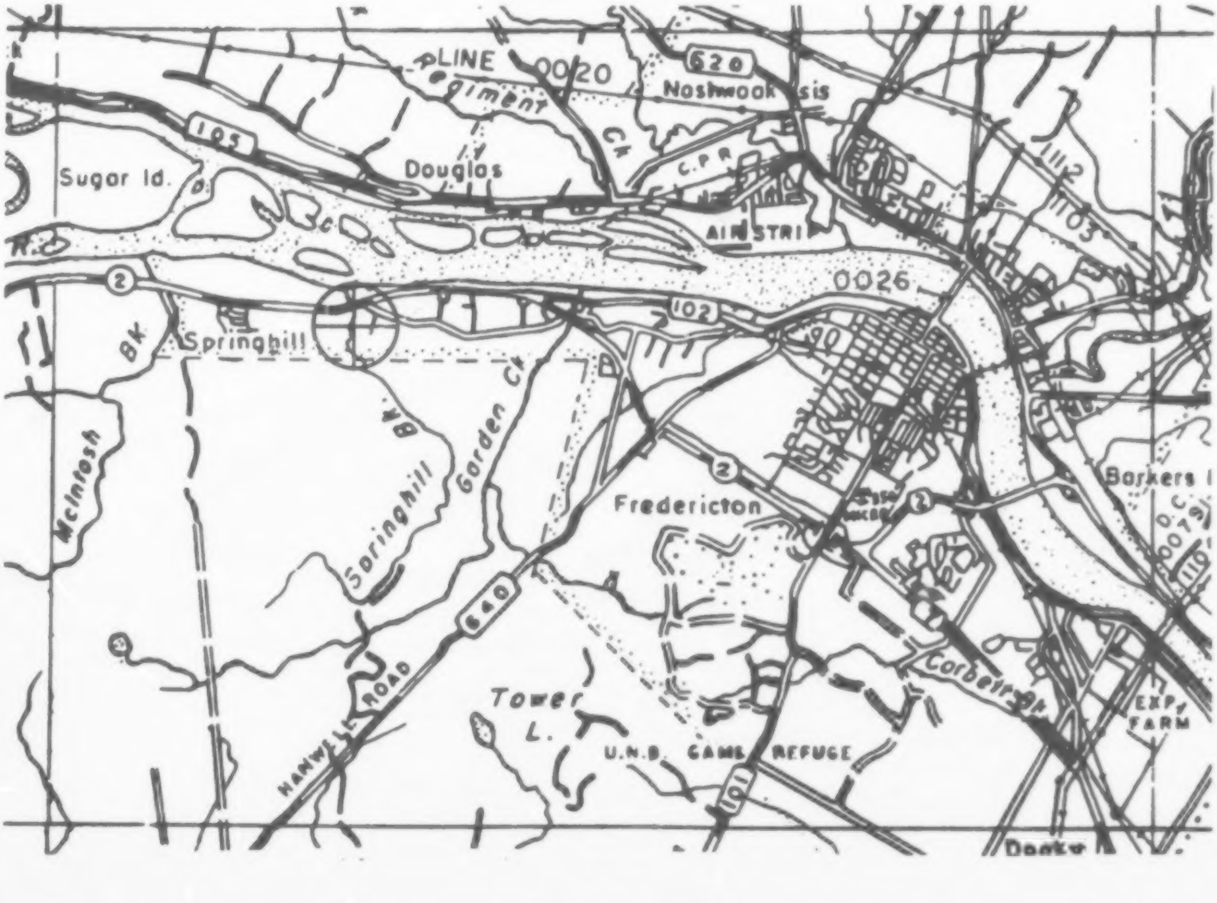
Locality: SPRINGHILL Quarry, 5 kilometers west of Fredericton

Rock Type: Silurian SLATE, meta-argillite (siltstone)

Location Map: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Regiment
Ck
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Sugar Id.
Douglas
C.P.R.
AIRSTRIP
0026
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102
90
Springhill
Bk
Springhill
Garden Ck
McIntosh
Bk
Fredericton
2
640
Tower L.
HANWELL ROAD
U.N.B. GAME REFUGE
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ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R1

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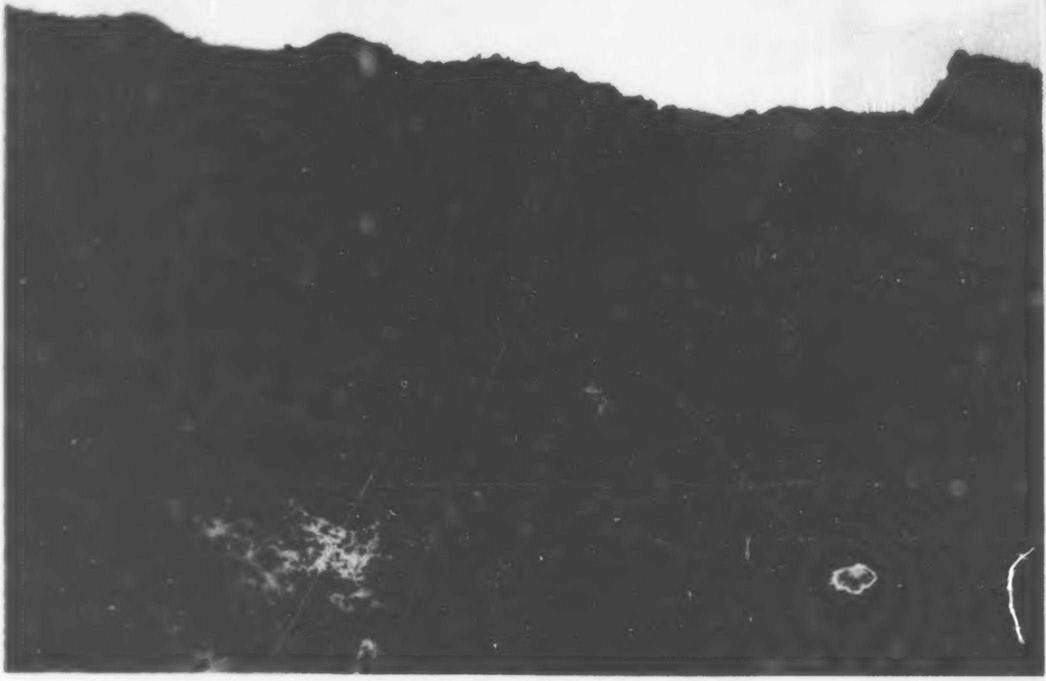

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

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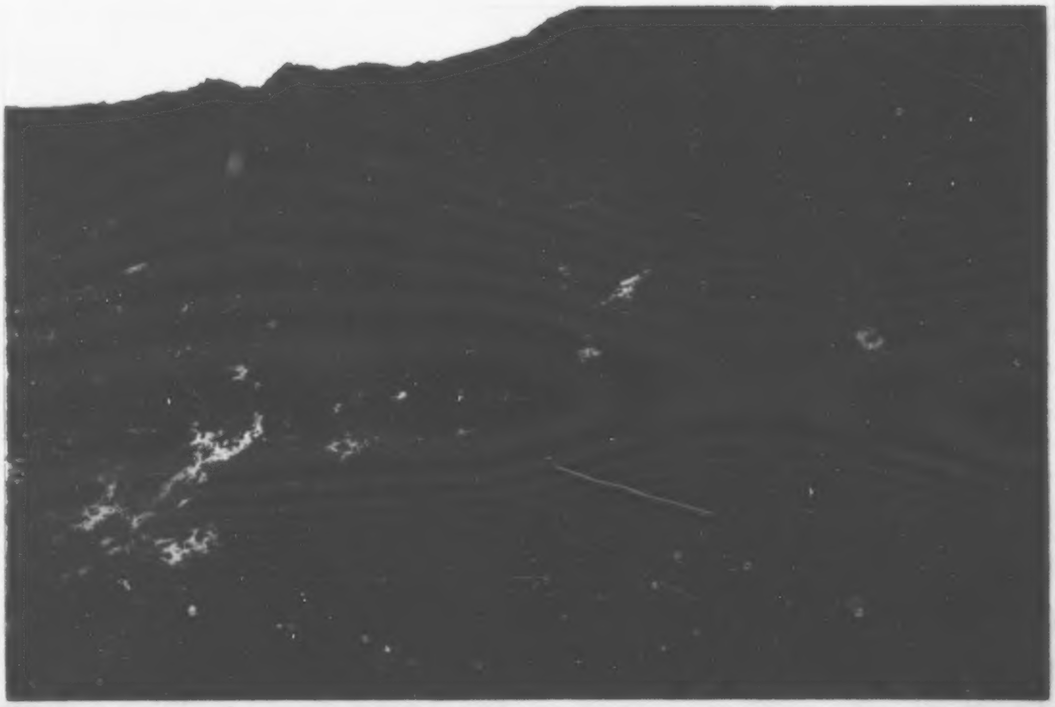
ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R1

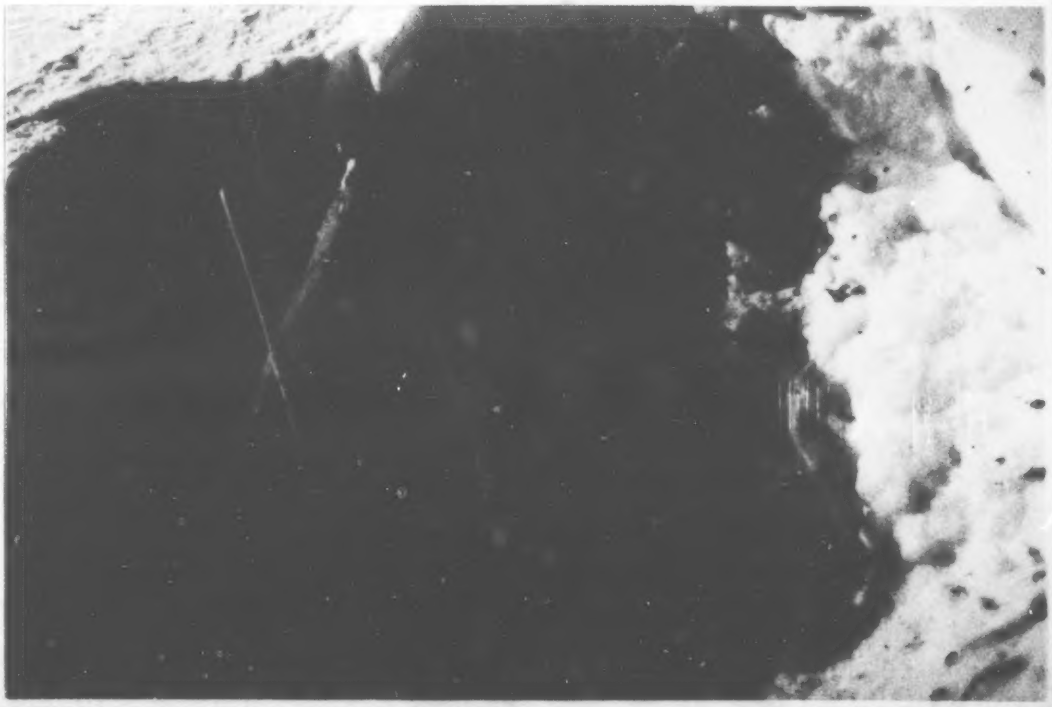


ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R1

Sample No: R1



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R1

ALKALI AGGREGATE REACTION STUDY

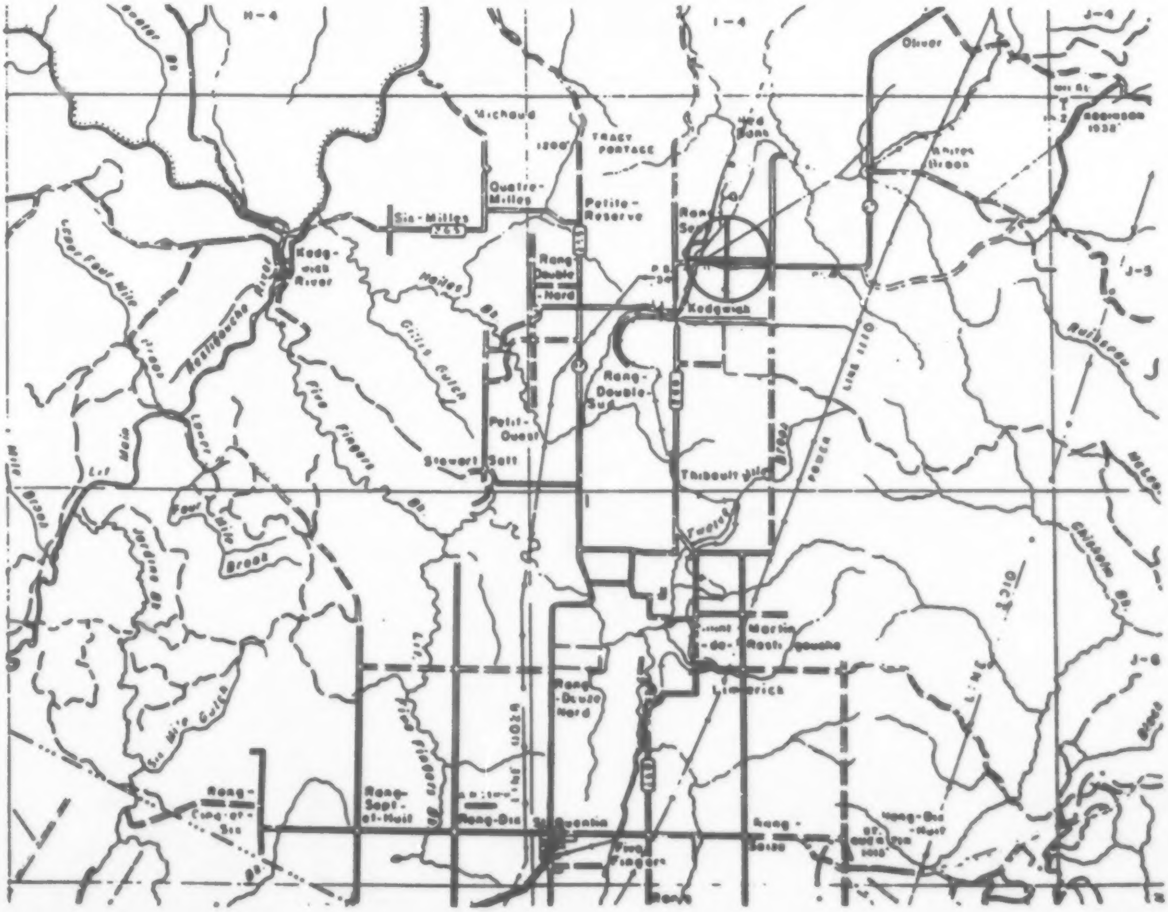
INVENTORY OF ROCK SAMPLES

Sample No: R2 **Page** 1 **of** 3

Locality: KEDGWICK
800 m east of Frazer's Sawmill on N. Side of Hwy 17

Rock Type: Ordovician or Silurian Grey
SLATE, meta-argillite (mudstone)

Location Map:


H-4
I-4
J-4
Michaud
Tracy Portage
Quatre-Milles
Six-Milles
Petite-Reserve
Kedg-wick River
Rang-Double-Nord
Kedgwick
Rang-Double-Sud
Petit-Ouest
Stewart Sett
Thibault Mills
Limerick
Rang-Deux-Nord
Rang-Sept-et-Huit
Rang-Dix
St-Quentia
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Restigouche River
Five Fingers Br.
J-5
J-6

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R2

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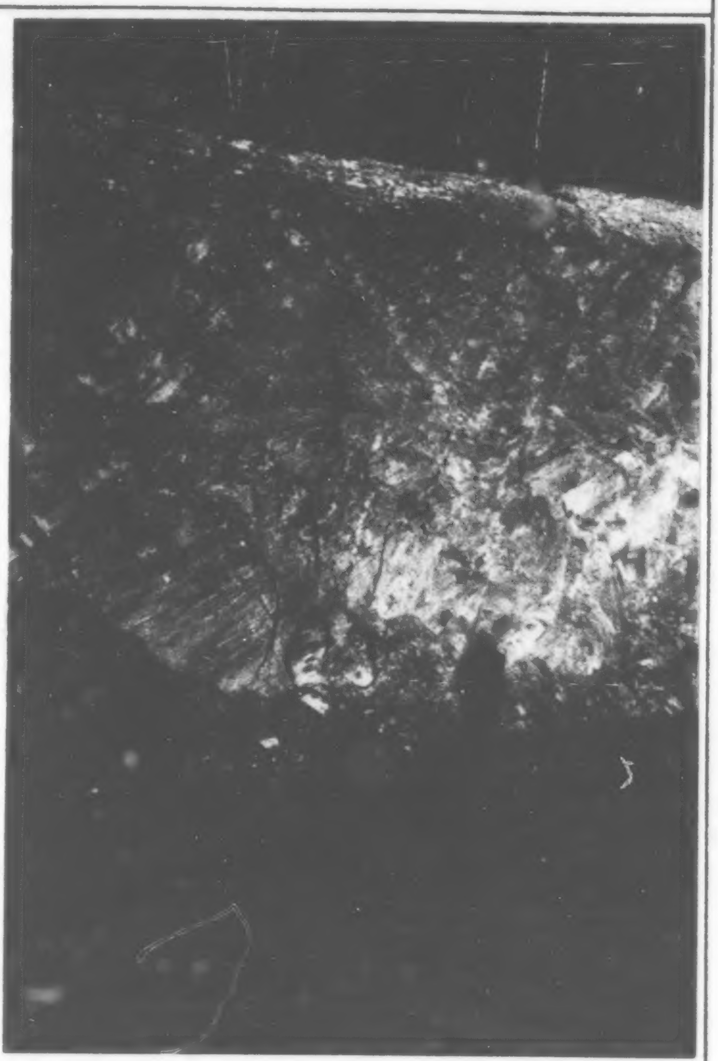
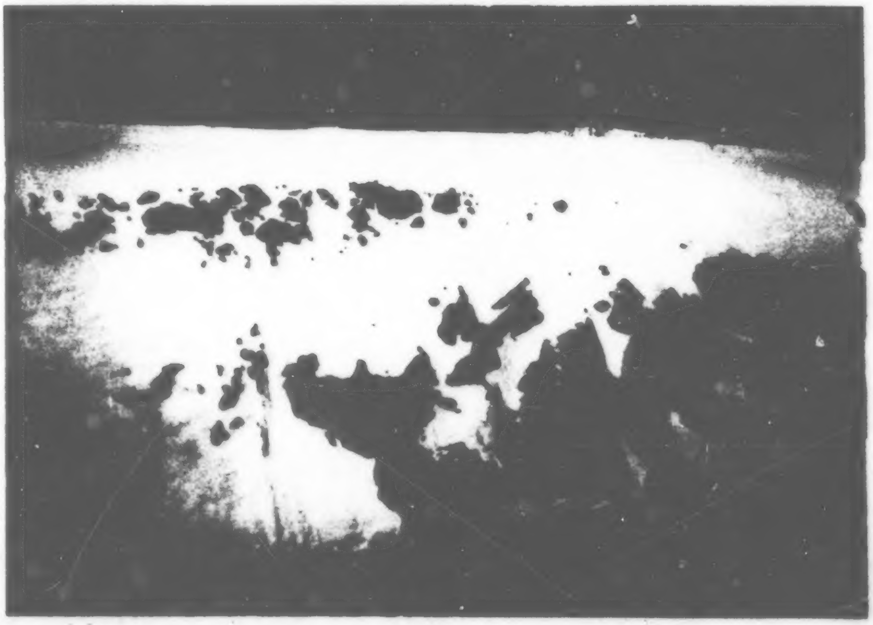


ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R2



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R3

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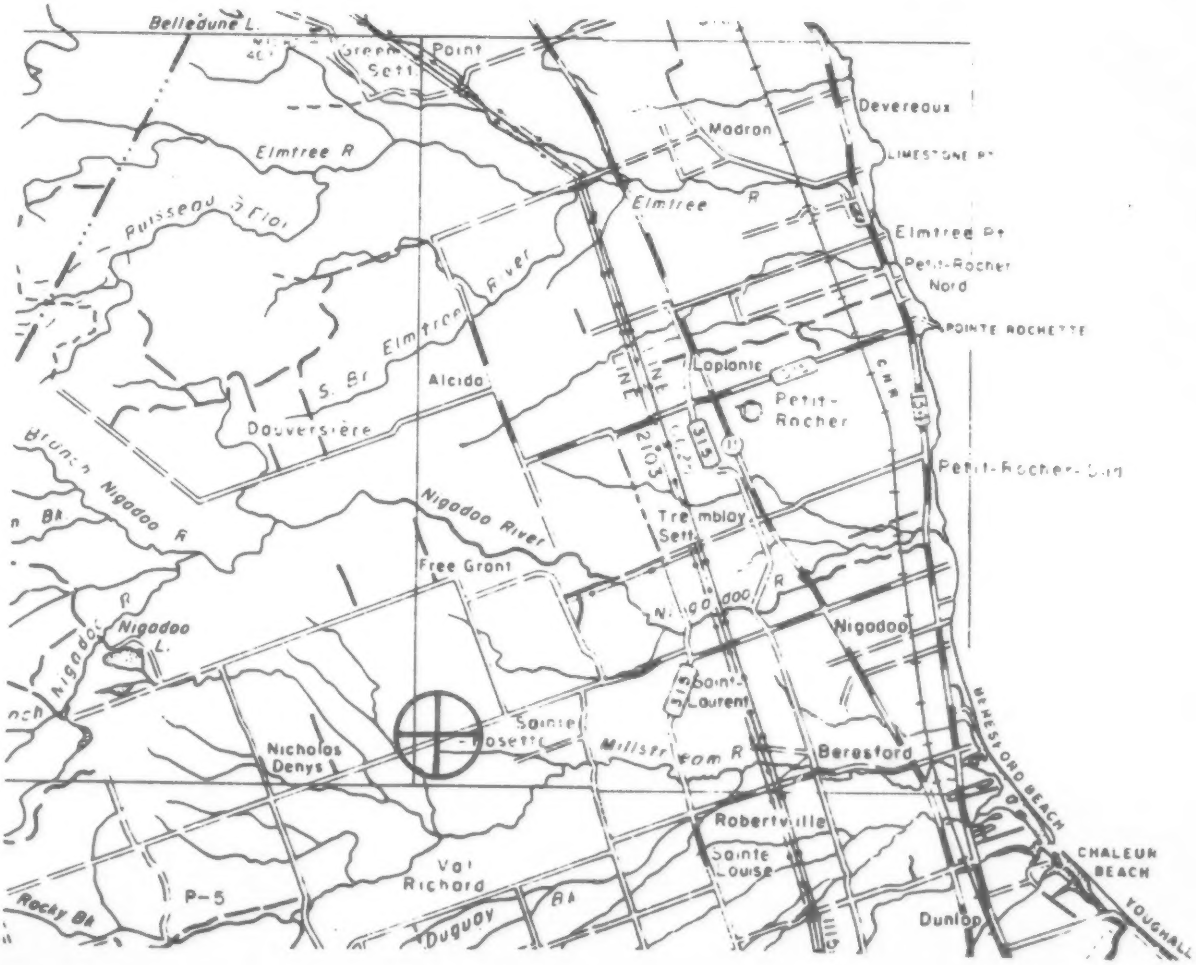
Locality: NICHOLAS DENYS, 20km north-west of Bathurst, 1.6km west of Madisco Road, on north side of road.

Rock Type: (Middle/Upper) Silurian SLATE, meta-argillite (siltstone)

Location Map: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Green Point Sett.
Devereaux
Madran
LIMESTONE PT
Elmtree R
Elmtree R
Elmtree Pt
Ruisseau à Flot
Petit-Rocher Nord
POINTE ROCHETTE
S. Br. Elmtree River
Alcida
Laplante
LINE
LINE 2103
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Petit-Rocher
Doucetsière
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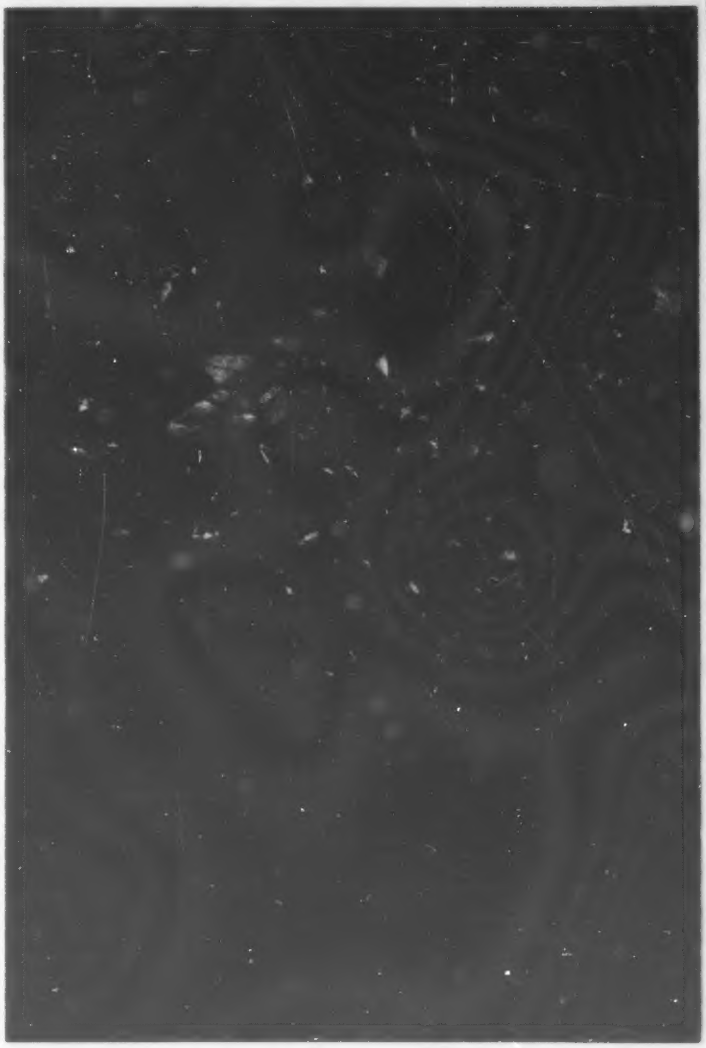
Branch Nigadoo R
Nigadoo River
Tremblay Sett.
Free Grant
Nigadoo R
Nigadoo
Nigadoo L.
Saint-Laurent
Nicholas Denys
Sainte-Rosette
Millstream R
Beresford
BERESFORD BEACH
Robertville
Sainte Louise
CHALEUR BEACH
Val Richard
P-5
Rocky Bk
Duguay Bk
Dunlop
YOUGHALL

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R3



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R3

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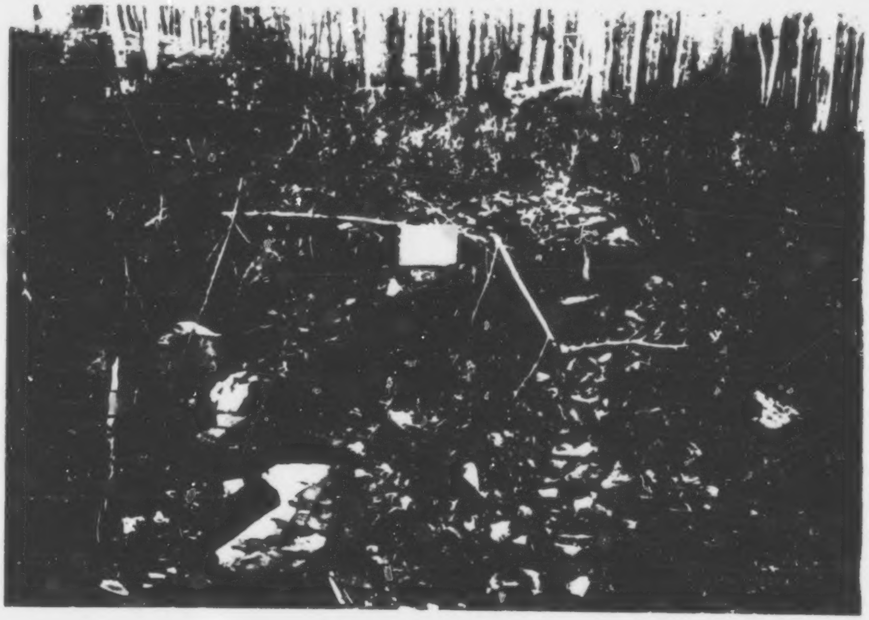


At time of sampling

ALKALI AGGREGATE REACTION STUDY

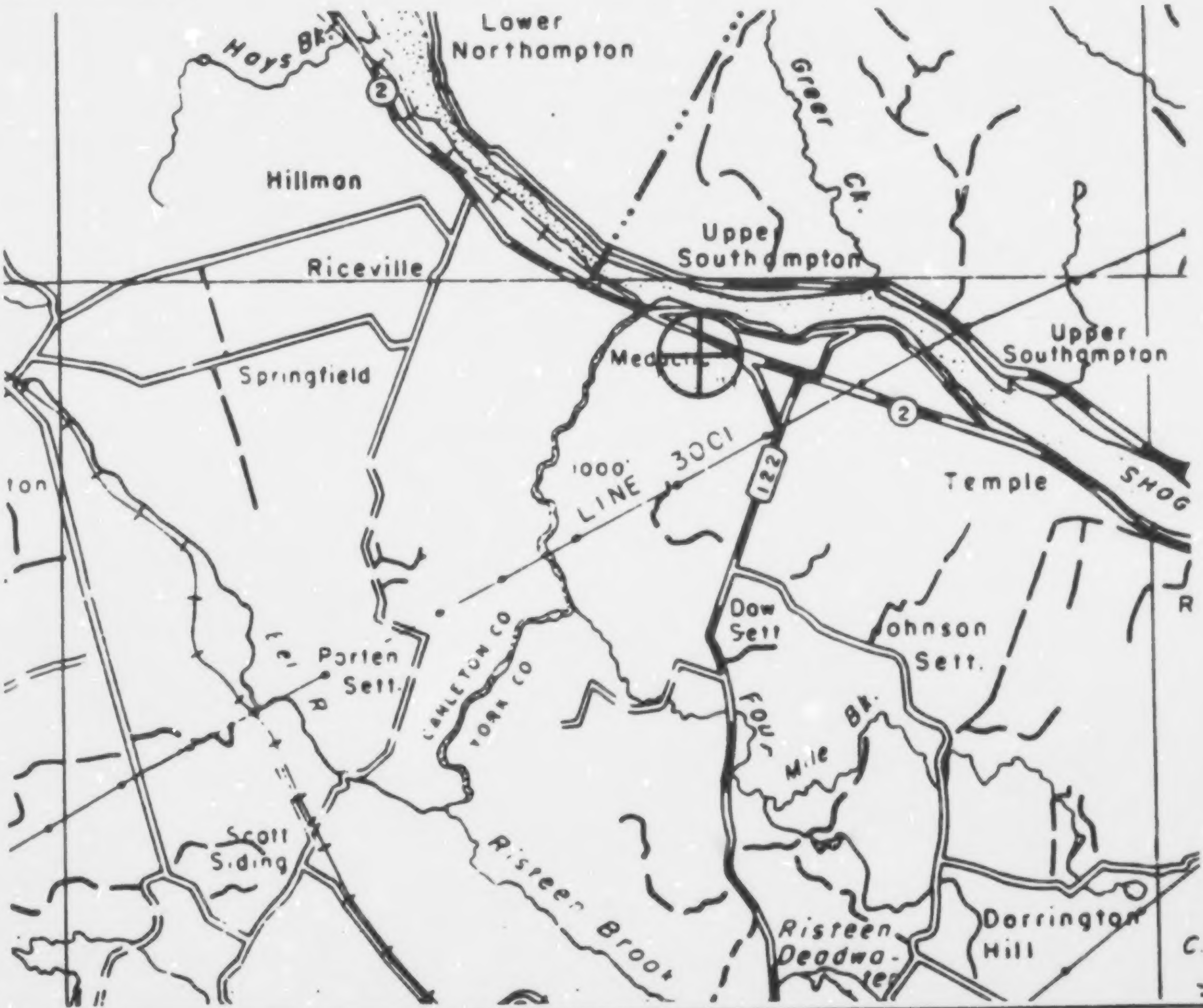
INVENTORY OF ROCK SAMPLES

Sample No: R4 **Page 1 of 2**

Locality: Meductic 0.2 km north-west of Canterbury turn-off; by Warren Maritime's sign; 900 m SE of Meductic Bridge; south west side of Highway No 2.

Rock Type: Ordovician SLATE, meta-argillite (siltstone), blue grey.

Location Map:


Hays Bk
Lower Northampton
2
Greer Ck
Hillman
Upper Southampton
Riceville
Springfield
Meductic
Upper Southampton
2
1000
LINE 30C1
122
Temple
SHOG
ton
R
Dow Sett
Johnson Sett.
Porten Sett.
CARLETON CO
YORK CO
Four Mile Bk
Scott Siding
Risteen Brook
Risteen Deadwater
Dorrington Hill
C

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R4

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ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

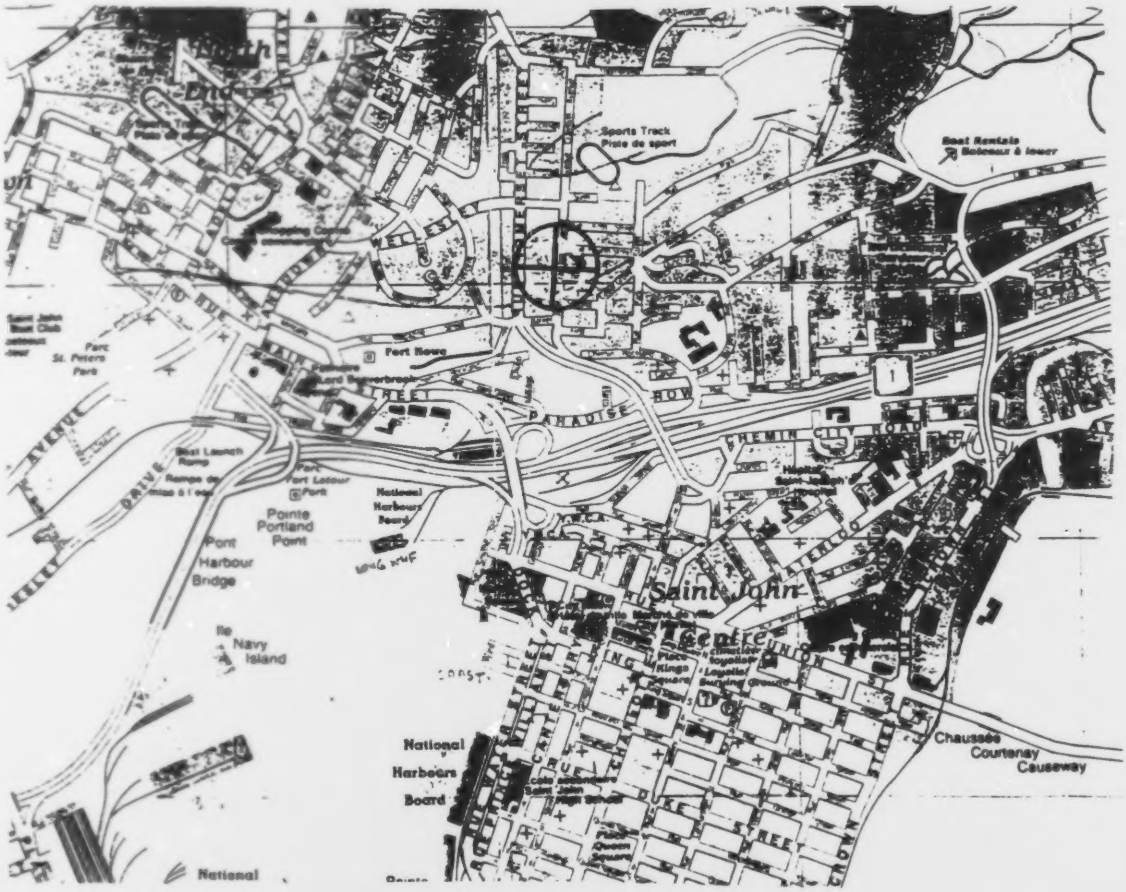
Sample No: R5

Page 1 **of** 3

Locality: SAINT JOHN, West side of Cranston Avenue between Third and Fourth Streets.

Rock Type: SCHIST

Location Map:


Sports Track
Piste de sport
Boat Rentals
Bateaux à louer
Saint John Boat Club
Fort St. Peters Park
Fort Howe
Paradise Row
Chemin
City Road
Boat Launch Ramp
Rampe de mise à l'eau
Fort Latour
Pointe Portland Point
National Harbours Board
Pont Harbour Bridge
Ile Navy Island
Saint John
Centre
Union
Chaussée Courtenay Causeway
National Harbours Board
Duke Street
Queen Square
National

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R5

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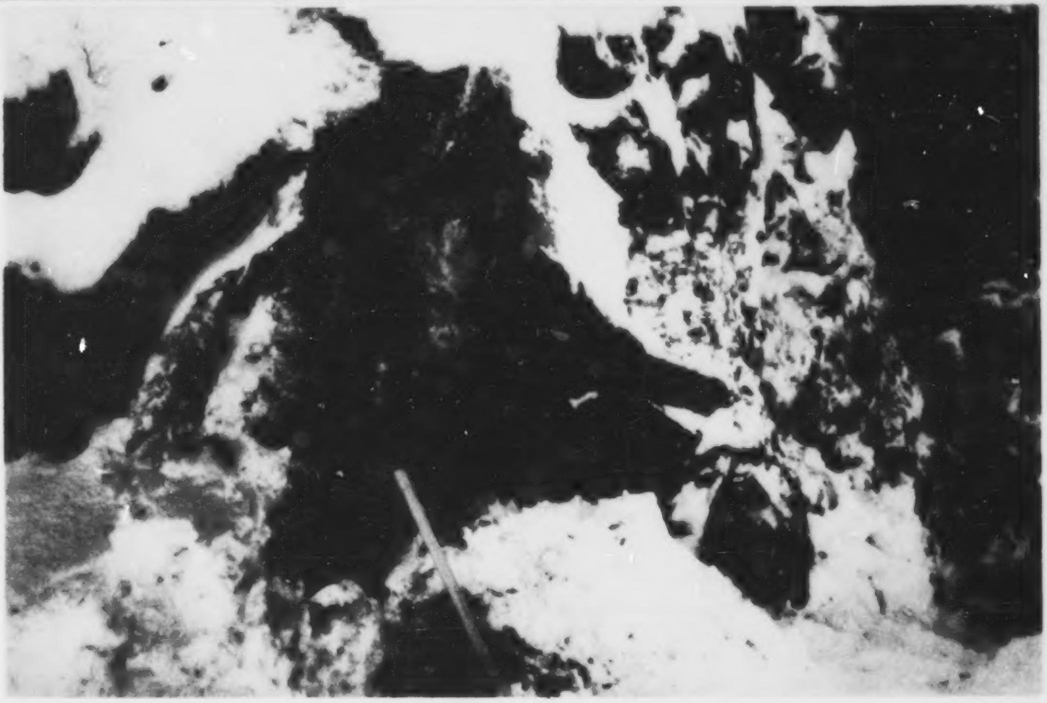
ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R5

Page 3 **of** 3



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

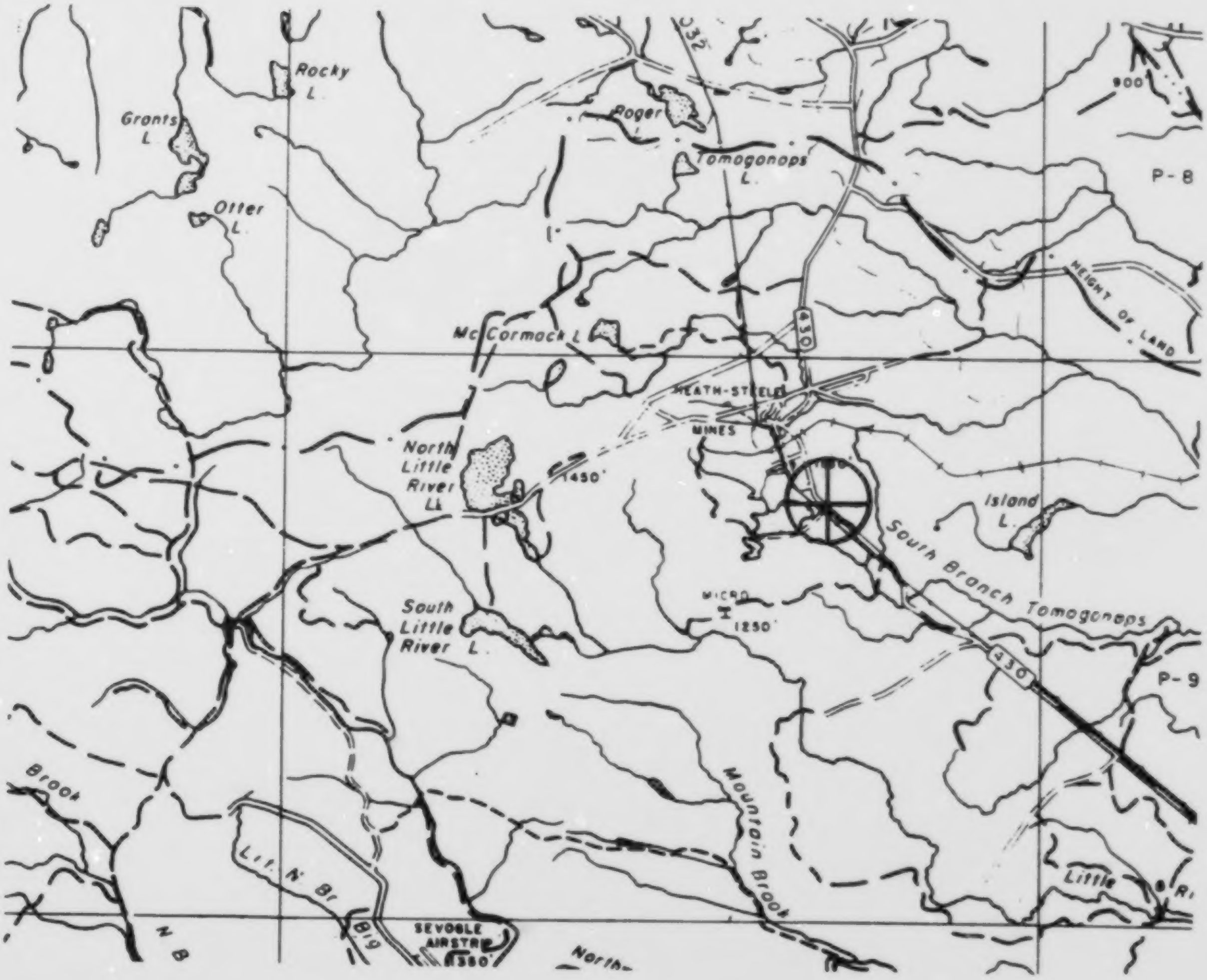
Sample No: R6

Page 1 **of** 2

Locality: HEATH - STEELE MINES 1.45 km south of RR crossing at Heath Steele Mines on Highway 430

Rock Type: Ordovician SCHIST

Location Map:


Rocky L.
Grants L.
Roger L.
Tomogonops L.
Otter L.
900'
P-8
HEIGHT OF LAND
430
Mc Cormack L
HEATH-STEELE
MINES
North Little River L.
1450'
Island L.
South Branch Tomogonops
MICRO
1250'
South Little River L.
430
P-9
Brook
Mountain Brook
Lit. N. Br
Big
SEVOGLE AIRSTRIP
1350'
North
N B
Little R

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R6

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ALKALI AGGREGATE REACTION STUDY

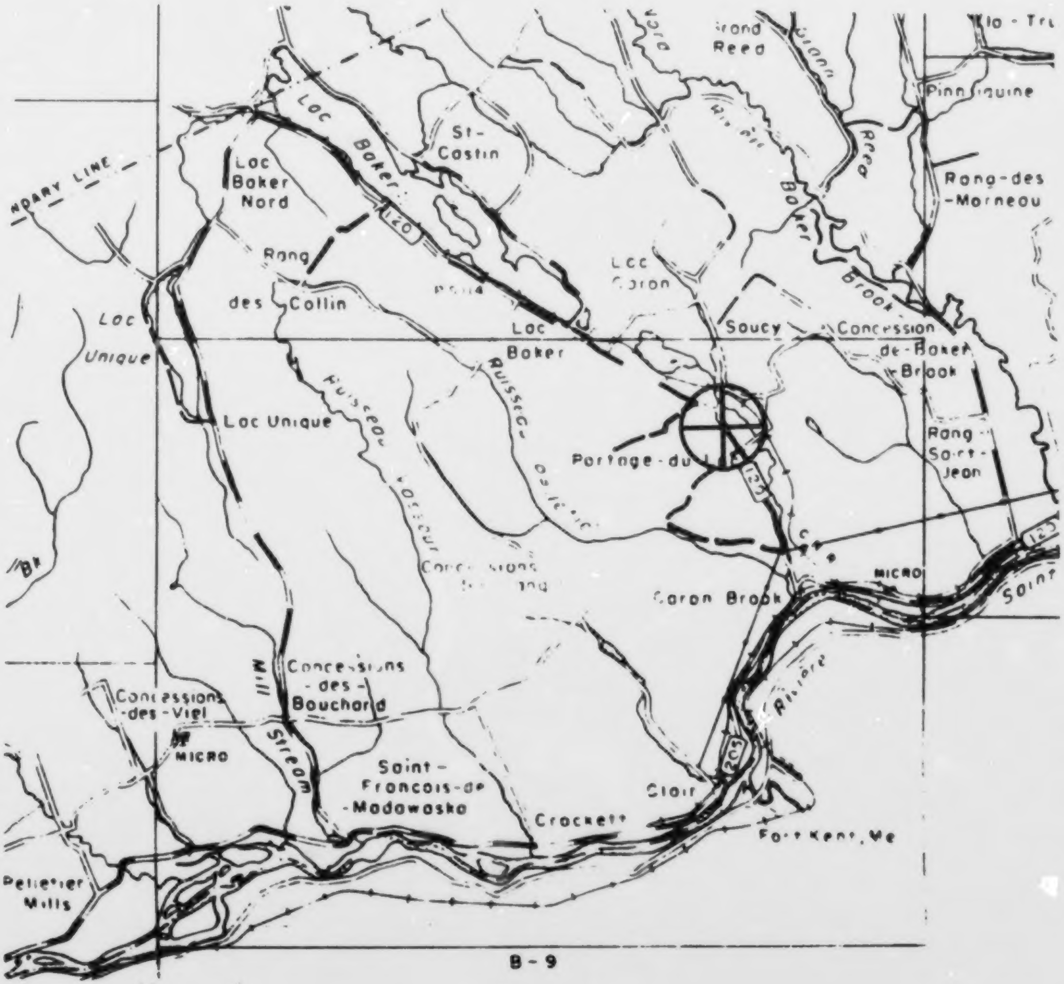
INVENTORY OF ROCK SAMPLES

Sample No: R7 **Page** 1 **of** 3

Locality: PORTAGE-DU-LAC (Near Baker Lake) 200 m south fo Soucy Road turn-off on west side of Hwy 120.

Rock Type: Devonian META-GREYWACKE (quartz wacke)

Location Map:


Grand Reed
Pinnaquine
Rang-des-Morneau
St-Castin
Lac Baker
120
Lac Baker Nord
DARY LINE
Rang des Collin
Lac Caron
Baker Brook
Reed
Soucy
Concession-de-Baker-Brook
Loc Baker
Lac Unique
Lac Unique
Ruisseau
Portage-du
Rang-Saint-Jean
Caron Brook
MICRO
Saint
Concessions
Concessions-des-Bouchard
Concessions-des-Viel
MICRO
Mill Stream
Saint-Francois-de-Madawaska
Clair
Crockett
Fort Kent, Me
Pelletier Mills
205
120

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R7

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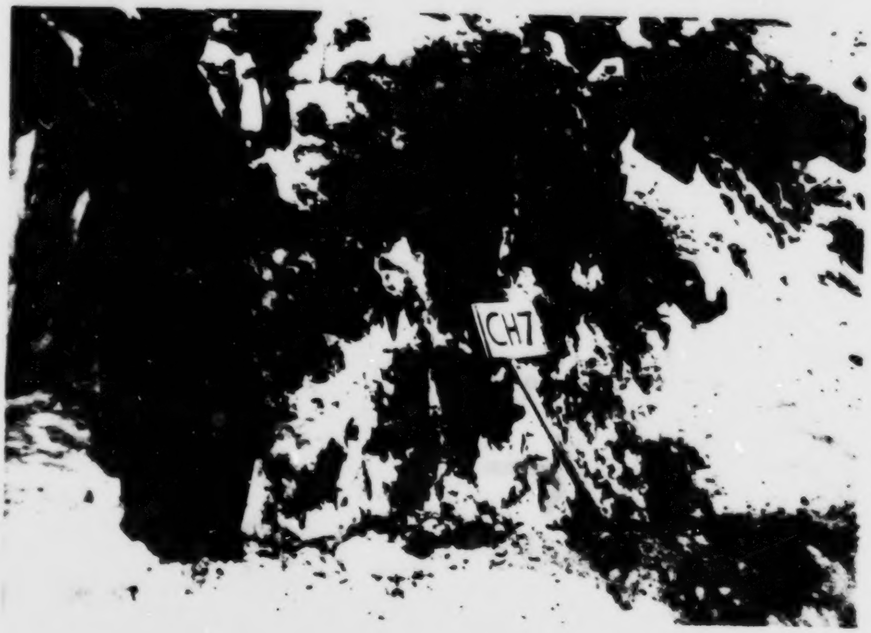
ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R7

Page 3 **of** 3



ALKALI AGGREGATE REACTION STUDY

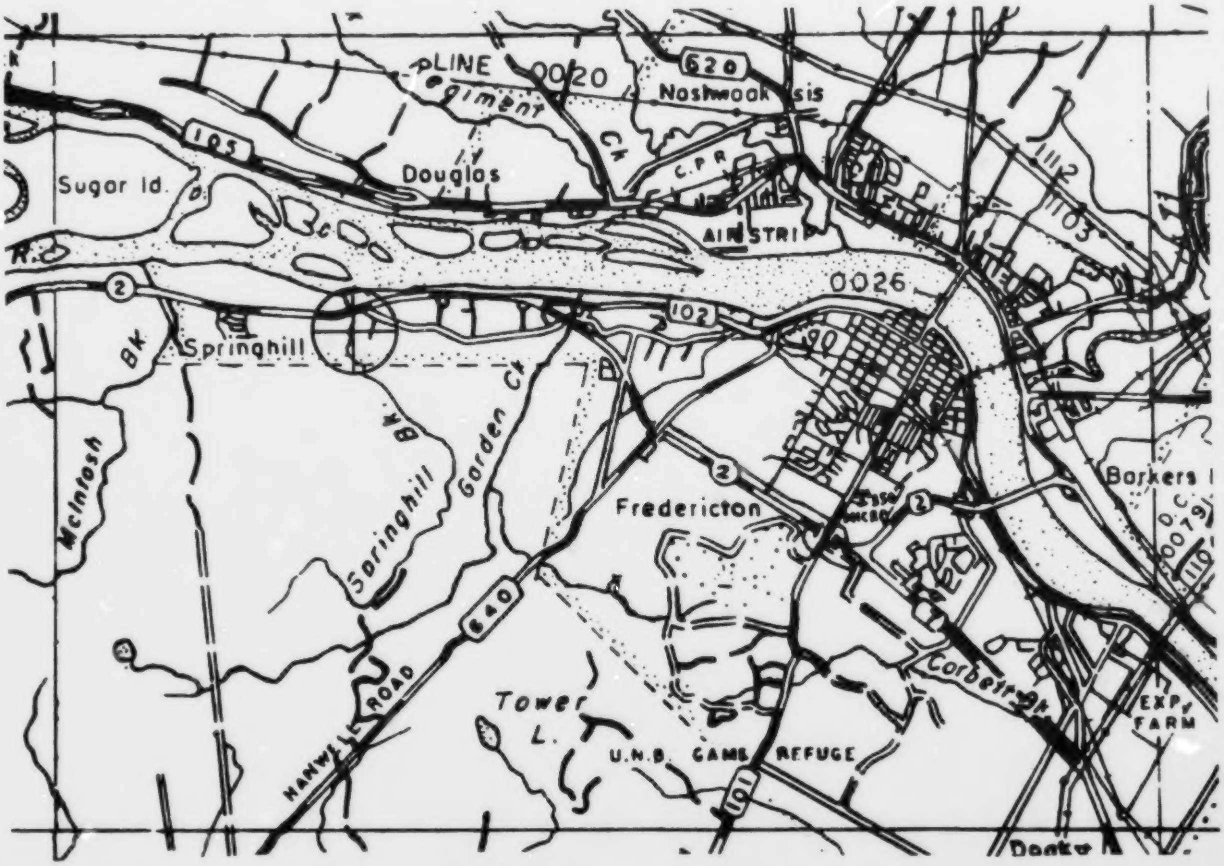
INVENTORY OF ROCK SAMPLES

Sample No: R8 **Page** 1 **of** 6

Locality: SPRINGHILL Quarry, 5 Km west of Fredericton

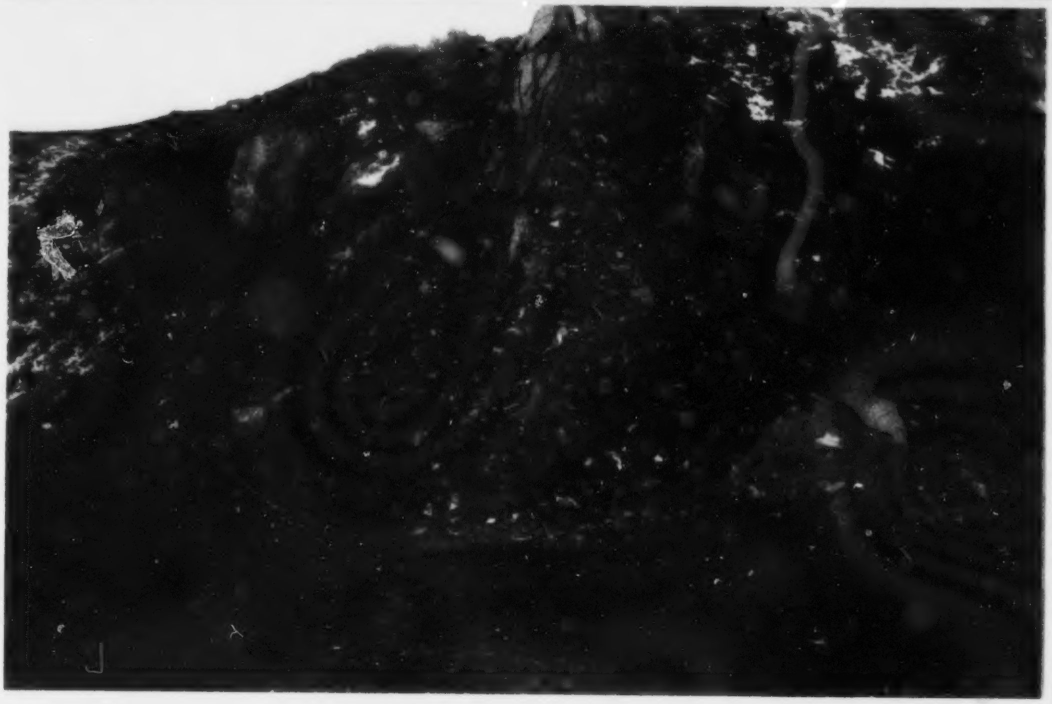
Rock Type: Silurian GREYWACKE

Location Map:


LINE
0020
620
Nashwaaksis
Regiment
Ck
105
Douglas
C.P.R.
Sugar Id.
AIRSTRIP
1112
1103
R.
2
0026
102
Bk
Springhill
90
McIntosh
Springhill
Bk
Garden Ck
2
Fredericton
2
Barkers
0079
640
Corbett Bk
Tower
L.
HANWELL ROAD
U.N.B. GAME REFUGE
101
EXP. FARM

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R8 **Page** 2 **of** 6

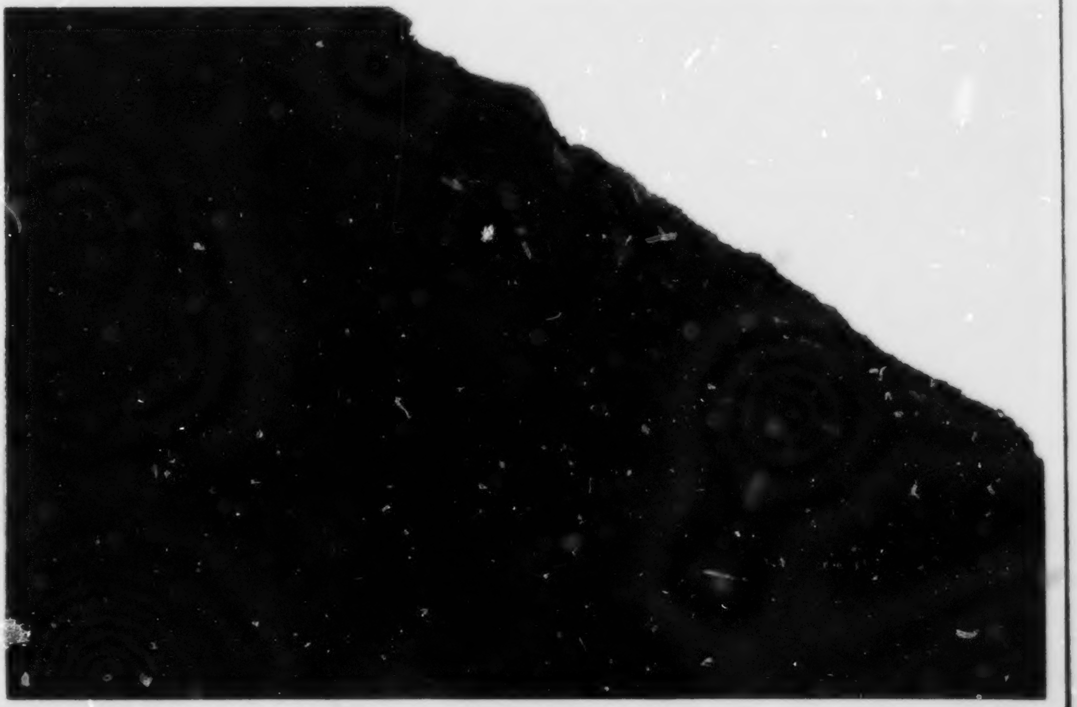


ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R8

Page 3 **of** 6

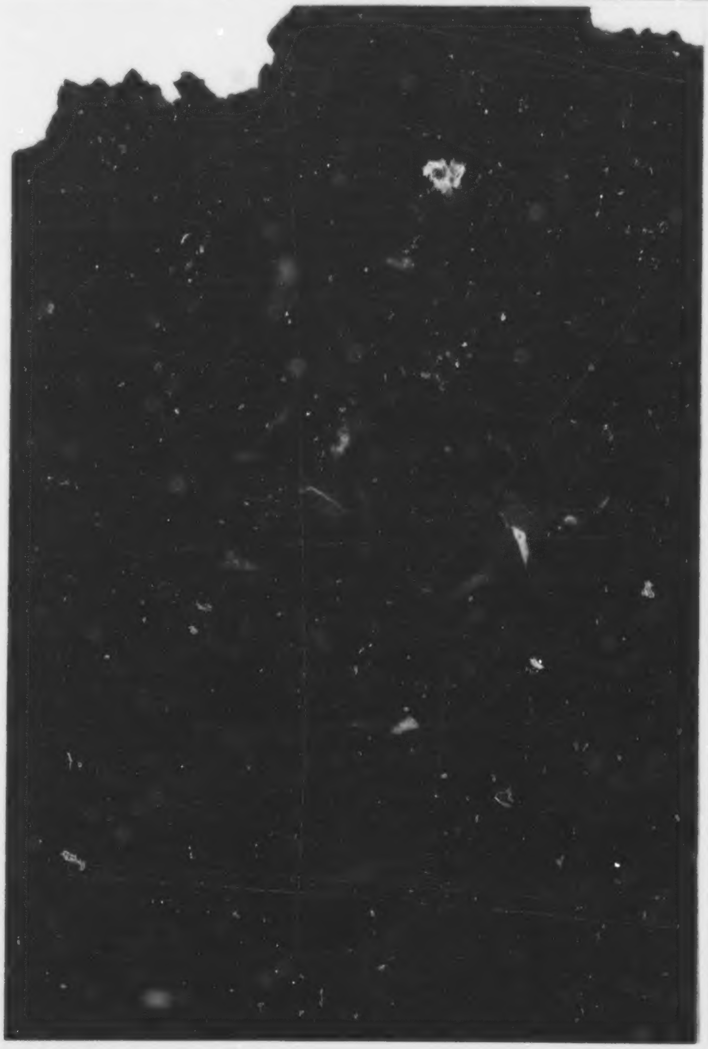


ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R8

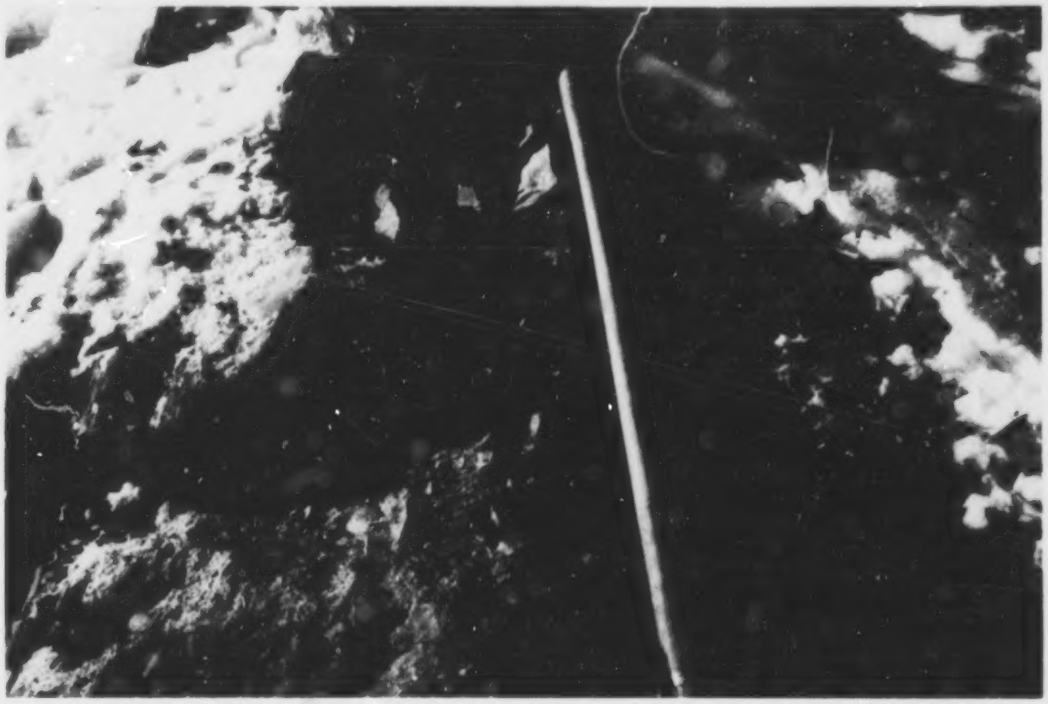
Page 4 **of** 6



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R8

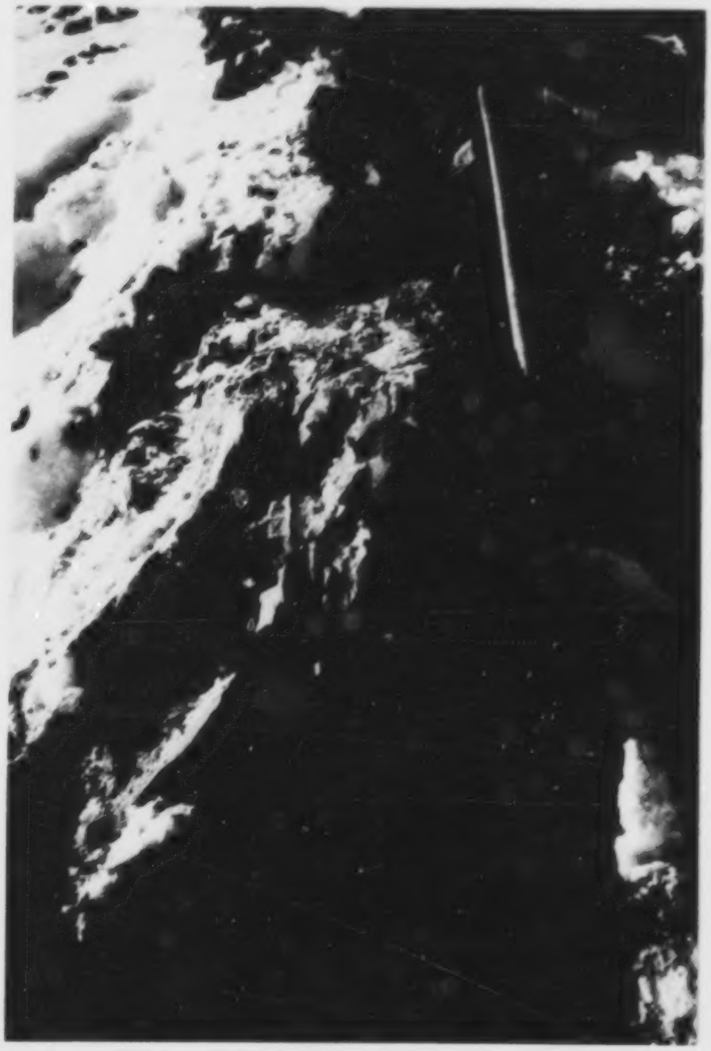


ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R8

Page 6 of 6



ALKALI AGGREGATE REACTION STUDY

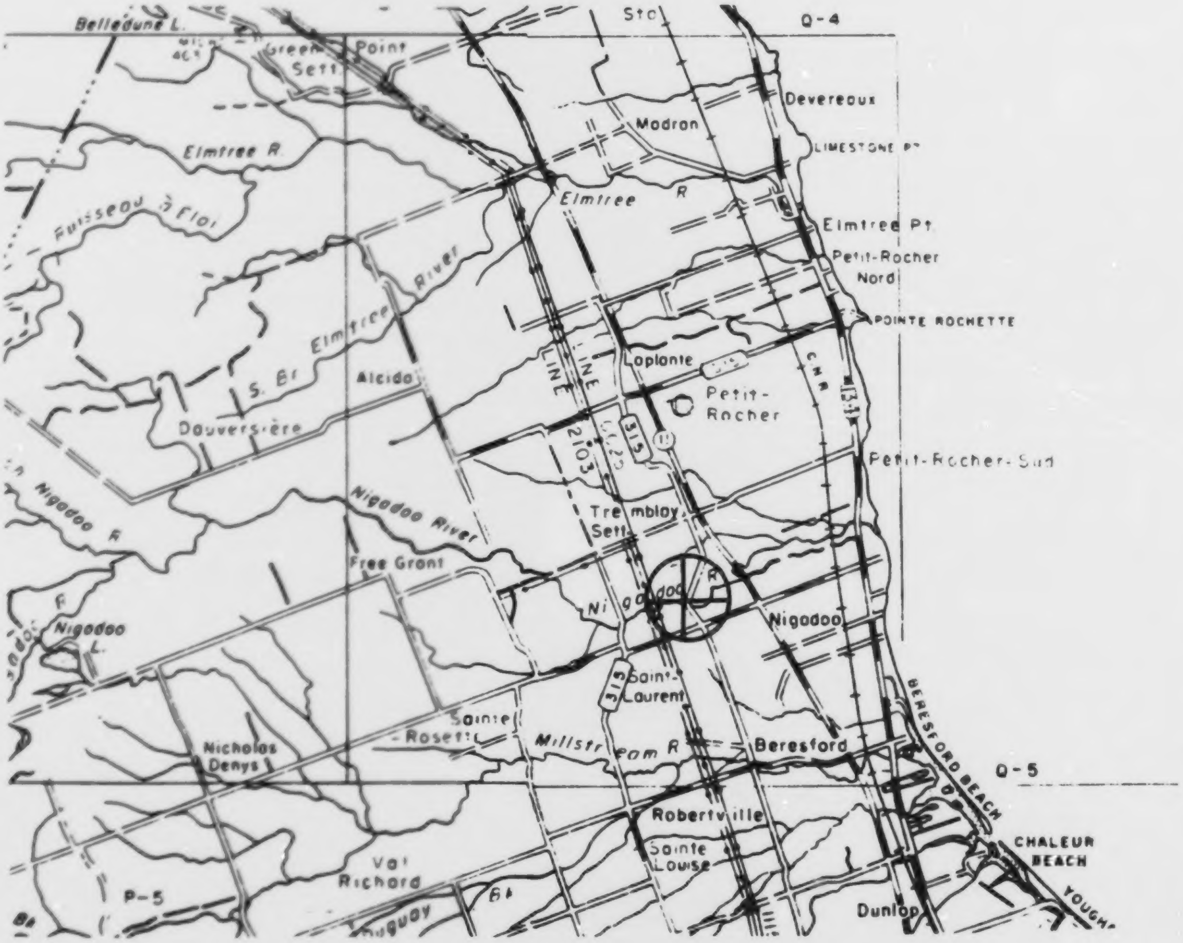
INVENTORY OF ROCK SAMPLES

Sample No: R9 **Page** 1 **of** 4

Locality: NIGADOO RIVER, 15 Km NNW of Bathurst 30 m± West of road on N bank of Nigadoo River (left bank)

Rock Type: (Middle & Upper) Silurian GREYWACKE
Blue grey

Location Map:


Belledune L.
Green Sett.
Point
Q-4
Devereaux
Madran
LIMESTONE PT
Elmtree R.
Elmtree
R
Elmtree Pt
Petit-Rocher Nord
Ruisseau à Flat
S. Br Elmtree River
POINTE ROCHETTE
Alcida
Laplante
Petit-Rocher
LINE
2103
315
CNR
Dauversière
Petit-Rocher-Sud
Nigadoo R
Nigadoo River
Tremblay Sett.
Free Grant
Nigadoo
R
Nigadoo L.
Saint-Laurent
Sainte-Rosette
Millstream R
Beresford
Nicholas Denys
BERESFORD BEACH
Q-5
Robertville
Sainte Louise
CHALEUR BEACH
Val Richard
P-5
Dunlop
YOUGHALL

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R9

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ALKALI AGGREGATE REACTION STUDY

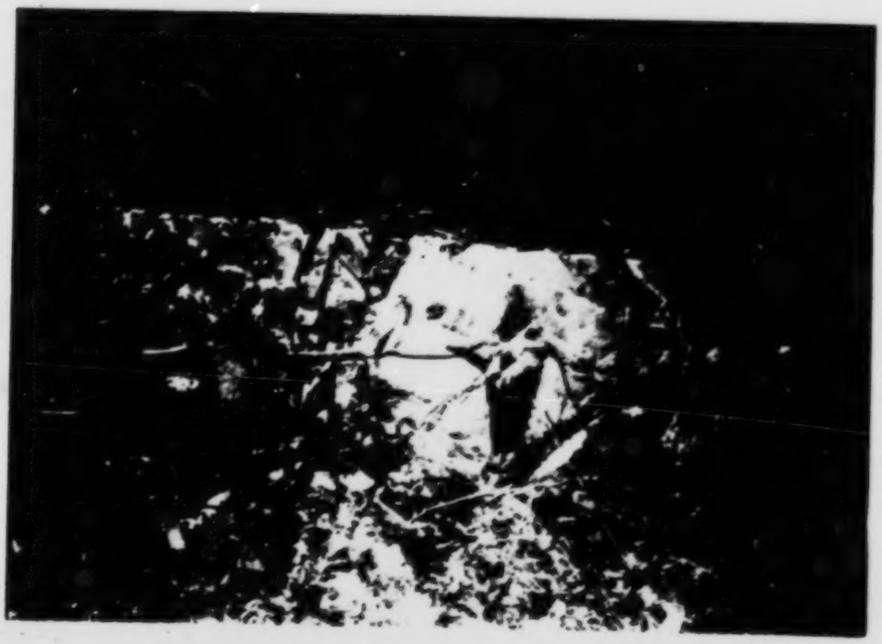
INVENTORY OF ROCK SAMPLES

Sample No: R9 **Page** 3 **of** 4

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R9



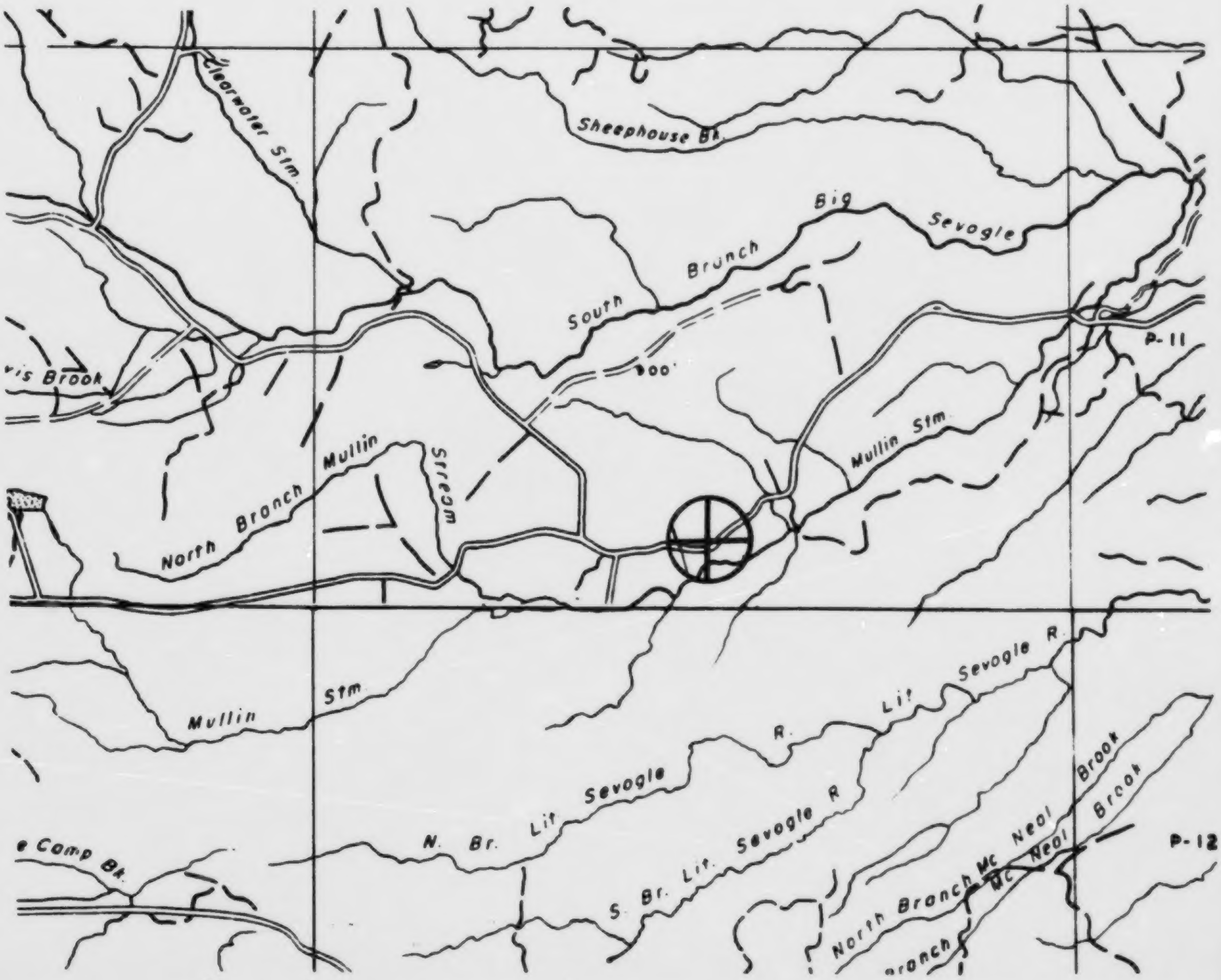
ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R10 **Page** 1 **of** 3

Locality: MULLIN LAKE ROAD, 40 Km west of Newcastle, north side of road

Rock Type: Ordovician QUARTZITE

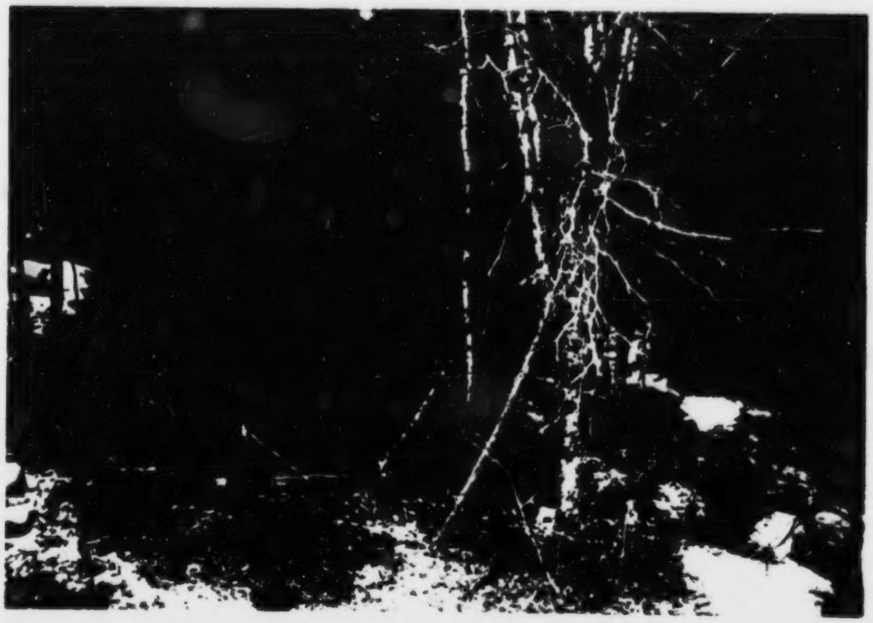
Location Map:


Clearwater Stm.
Sheephouse Bk
Big
Sevogle
South
Branch
vis Brook
900'
P-11
Mullin
North Branch
Stream
Mullin Stm
Mullin
Stm
Sevogle R.
R.
Lit
N. Br. Lit. Sevogle
S. Br. Lit. Sevogle R
e Camp Bk
North Branch Mc Neal Brook
Mc Neal Brook
Branch
P-12

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R10



On reconnaissance

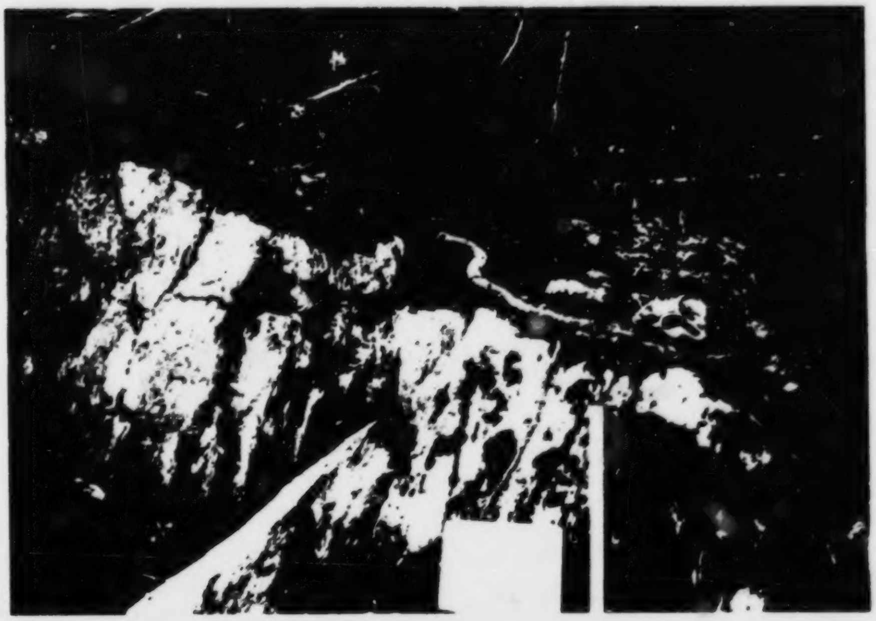
At time of sampling

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R10

Page 3 **of** 3



At time of sampling

ALKALI AGGREGATE REACTION STUDY

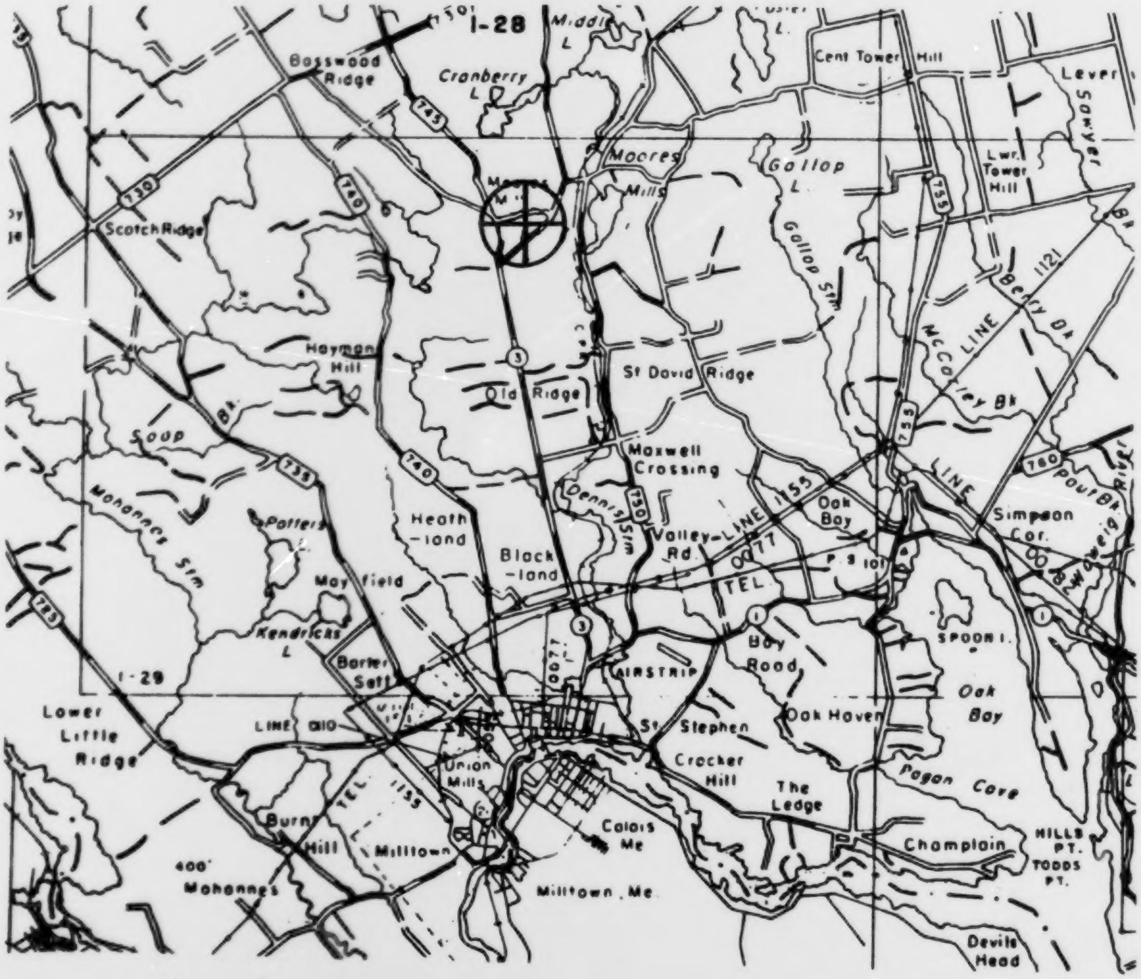
INVENTORY OF ROCK SAMPLES

Sample No: R11 **Page** 1 **of** 2

Locality: MOORES MILLS, 10Km north of St. Stephen 1.55 Km south of Tower Hill turn-off, on NW side of Highway 3

Rock Type: Silurian QUARTZITE, pale grey

Location Map:

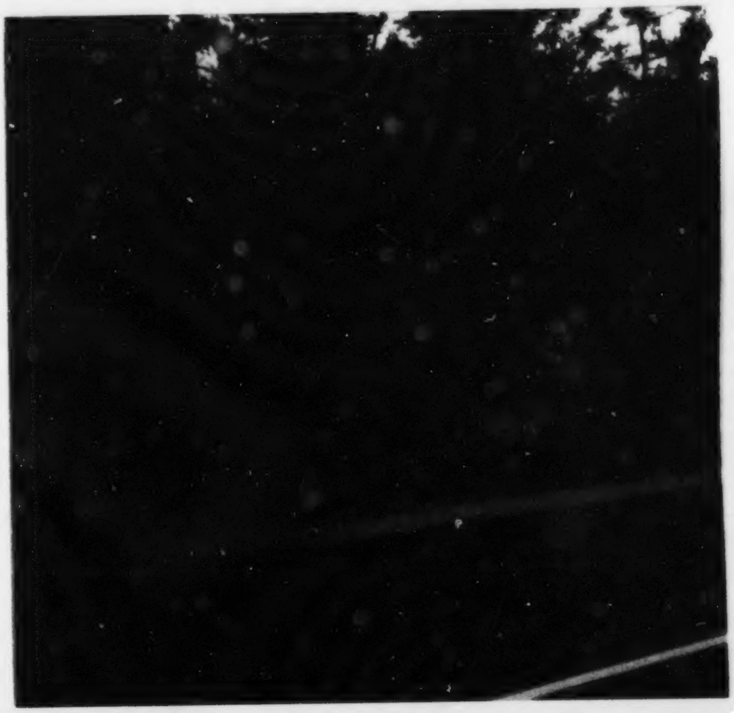

I-28
Middle L
Bosswood Ridge
Cranberry L
Cent Tower Hill
Lever
Sawyer
Moores Mills
Gallop L
Lwr. Tower Hill
Scotch Ridge
Gallop Stm
Berry Bk
McCorley Bk
LINE
Hayman Hill
Old Ridge
St David Ridge
Soap Bk
Maxwell Crossing
Mohannes Stm
Potters
Heath-land
Black-land
Dennis Stm
Valley Rd
Oak Bay
Simpson Cor.
Pour Bk
Mayfield
TEL
Kendricks L
Spoon I.
Bay Road
Barter Sett
I-29
Airstrip
Oak Haven
Oak Bay
Lower Little Ridge
St Stephen
Union Mills
Crocker Hill
The Ledge
Pagan Cove
Burnt Hill
Milltown
Calais Me
Champlain
Hills Pt.
Todds Pt.
400'
Mohannes
Milltown, Me.
Devils Head
730
740
745
735
750
755
760
785
3
1
1121
1155
0077
0010

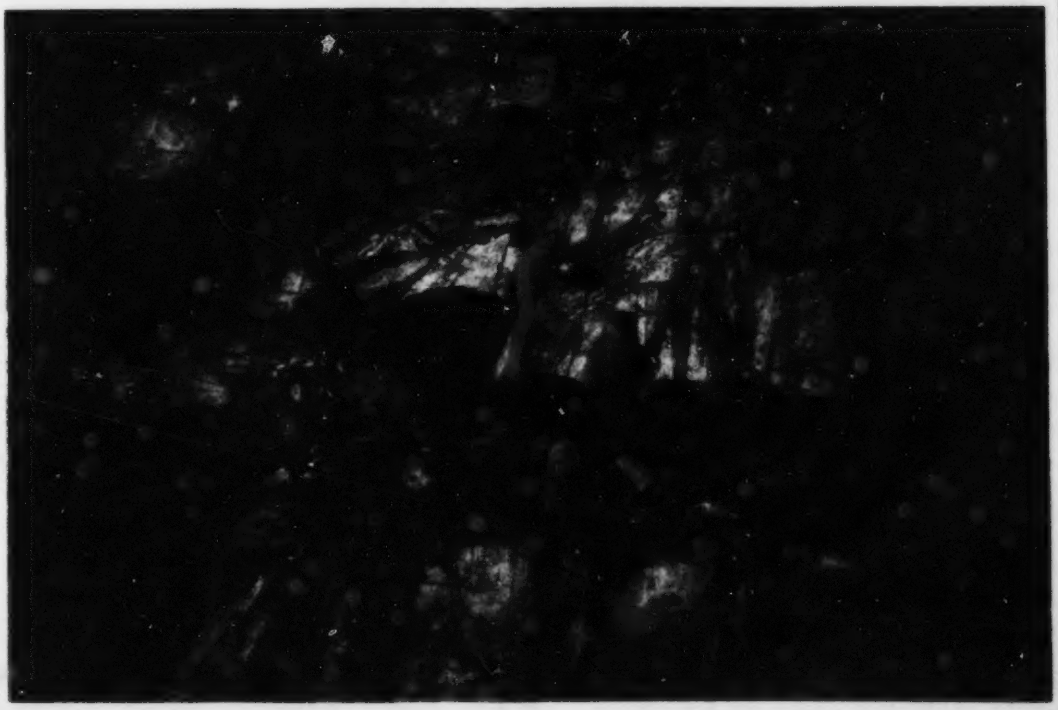
ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R11

Page 2 **of** 2





ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

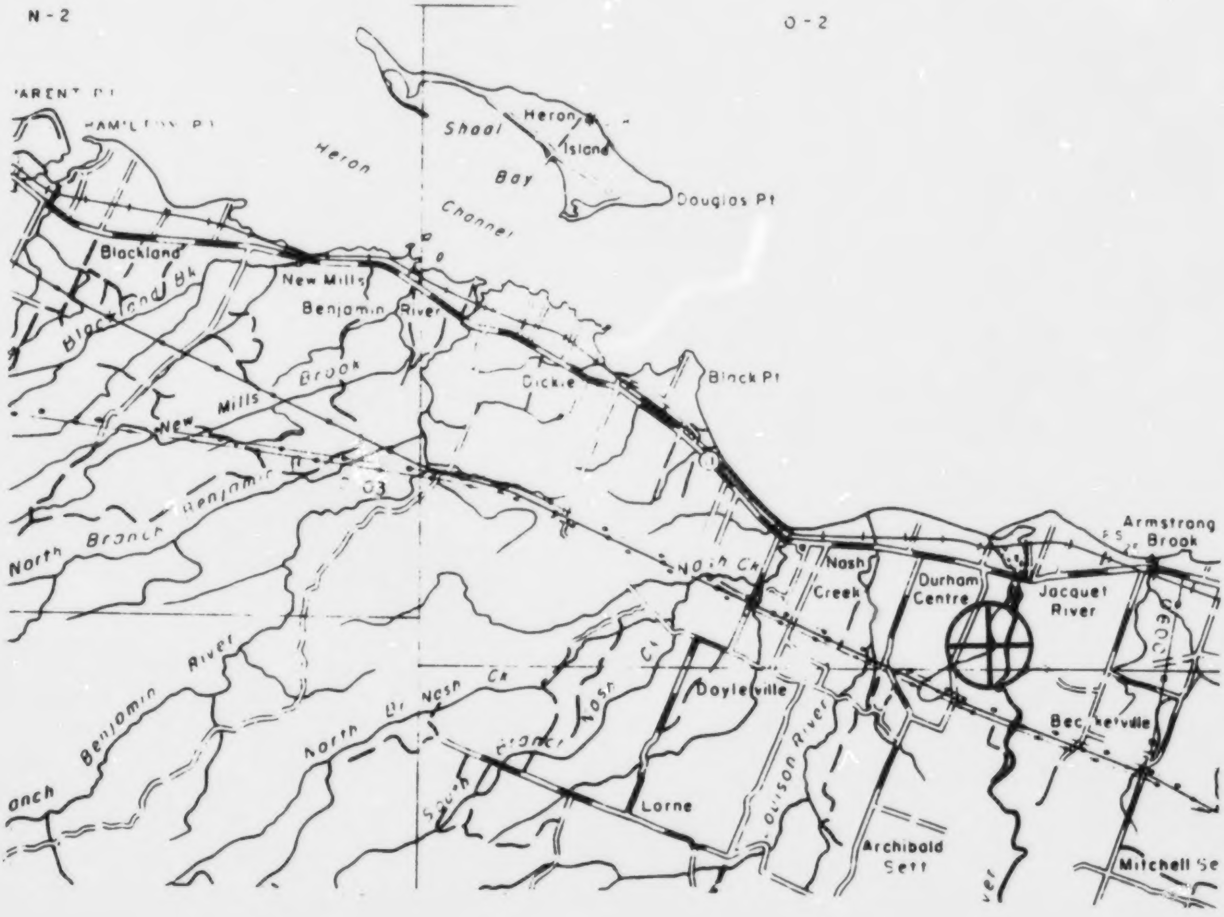
Sample No: R12

Page 1 **of** 2

Locality: JACQUET RIVER 450 m north west of new Jacquet River Bridge on "Bi-pass", north east side of road.

Rock Type: Silurian SILICIFIED VOLCANIC (Rhyolite)

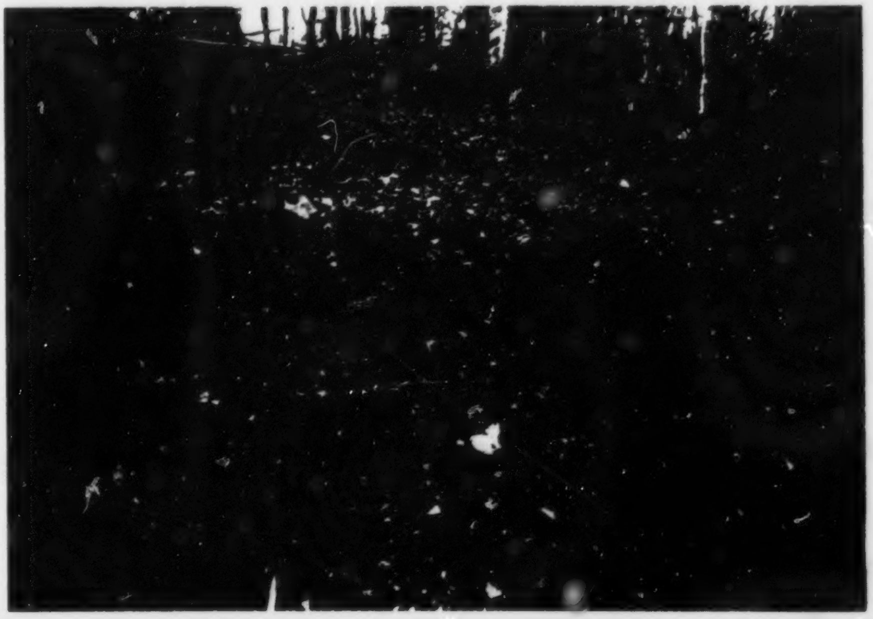
Location Map:

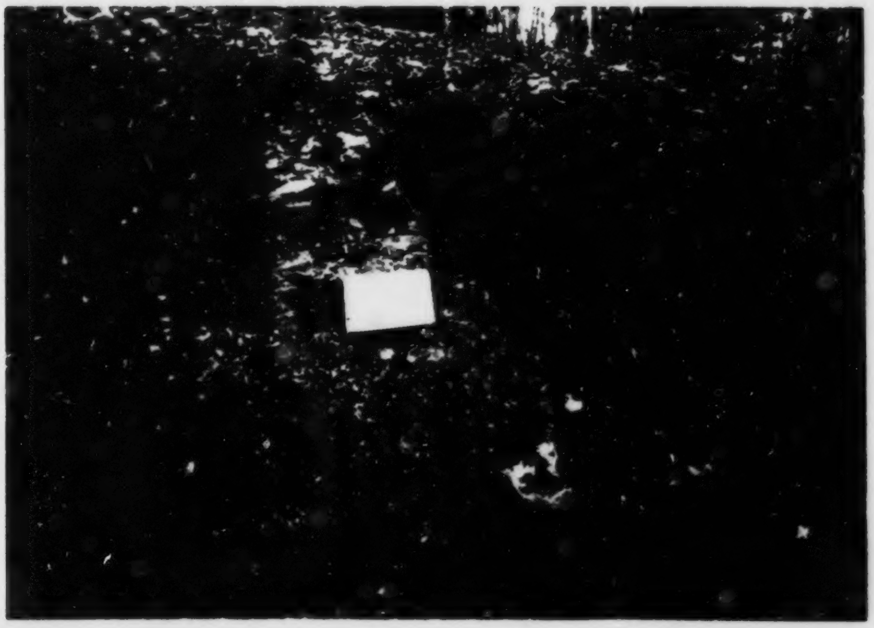

N-2
O-2
Heron Island
Shoal Bay
Heron Channel
Douglas Pt
Blackland
Blackland Bk
New Mills
Benjamin River
New Mills Brook
Dickie
Black Pt
North Branch Benjamin
Nash Ck
Nash Creek
Durham Centre
Jacquet River
Armstrong Brook
Doyleville
Benjamin River
North Br Nash Ck
South Branch Nash Ck
Lorne
Louison River
Archibald Sett
Bec
Mitchell Se

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R12 **Page** 2 **of** 2





ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

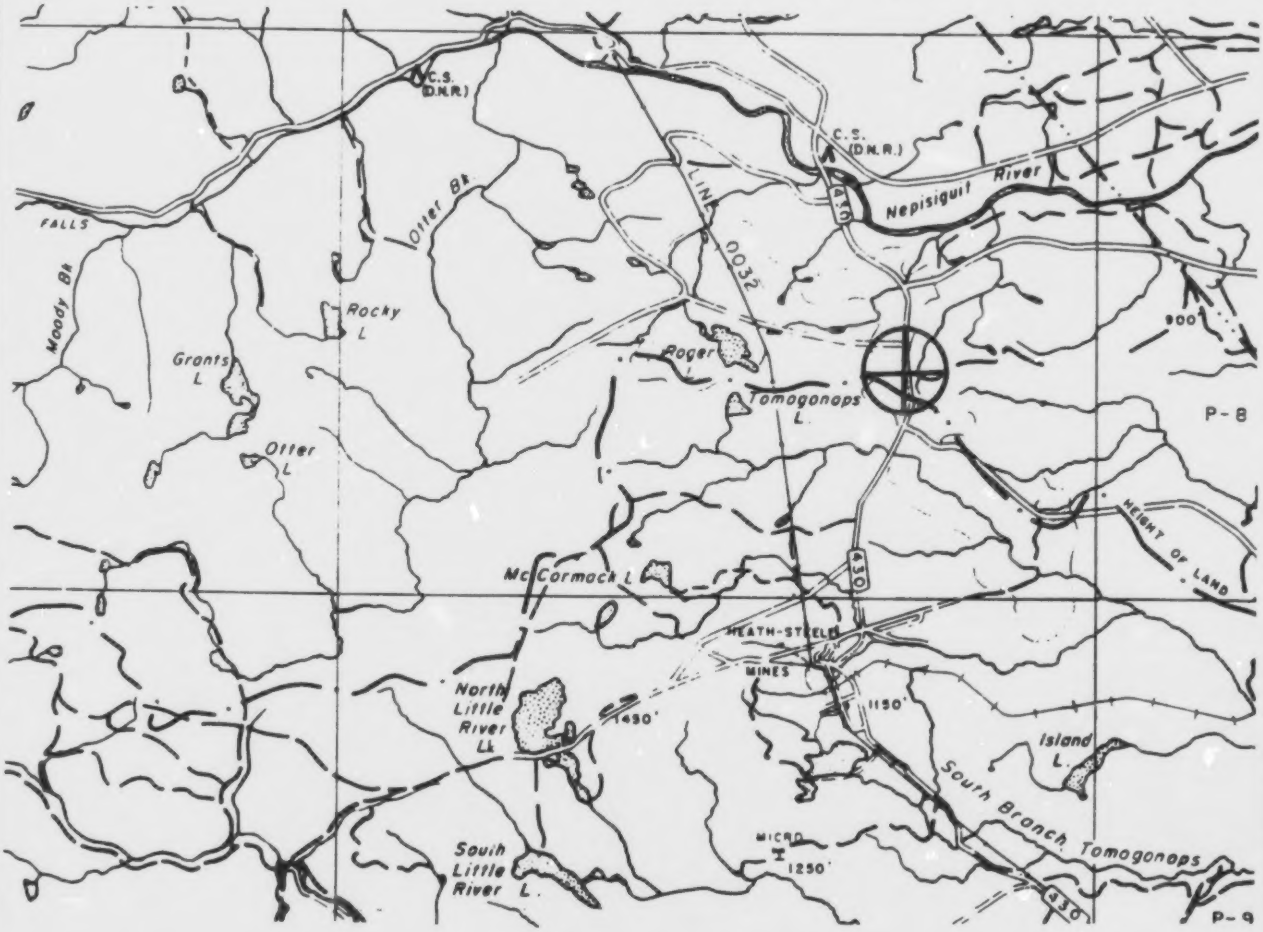
Sample No: R13

Page 1 **of** 3

Locality: TOMOGONOPS LAKE, Highway 430, 4 Km north of Heath-Steele Mines.

Rock Type: Ordovician MICROPHYRIC RHYOLITE

Location Map:


C.S. (D.N.R.)
C.S. (D.N.R.)
430
Nepisiguit River
Otter Bk
FALLS
Moody Bk
LINE 0032
Rocky L
Grants L
Roger L
Tomogonops L
Otter L
900'
P-8
HEIGHT OF LAND
McCormack L
430
HEATH-STEELE MINES
1150'
1450'
North Little River Lk
Island L
South Branch Tomogonops
MICRO 1250'
South Little River L.
430
P-9

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R13 **Page** 2 **of** 3

LEILA
PAT
Scott

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R13

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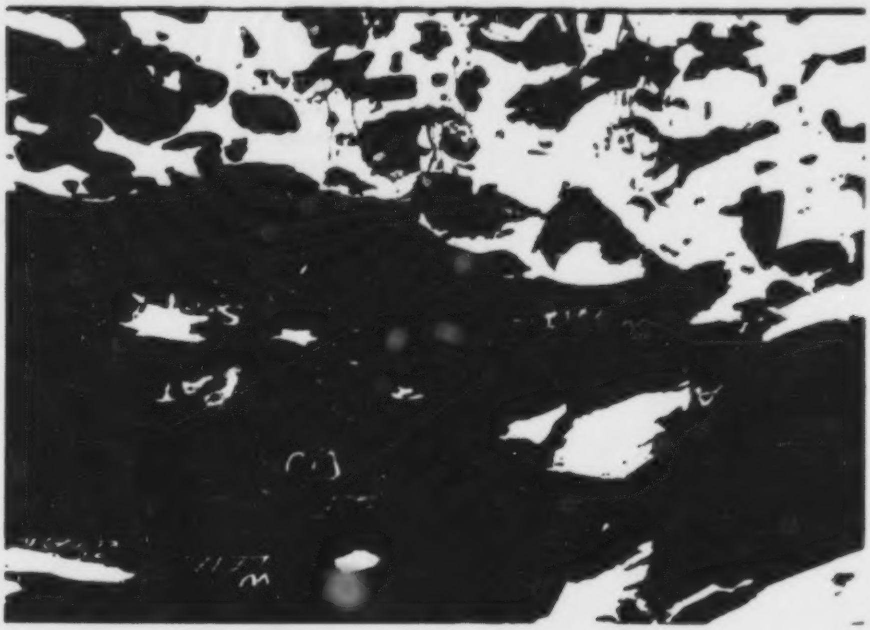


BEFORE

AFTER

At time of sampling

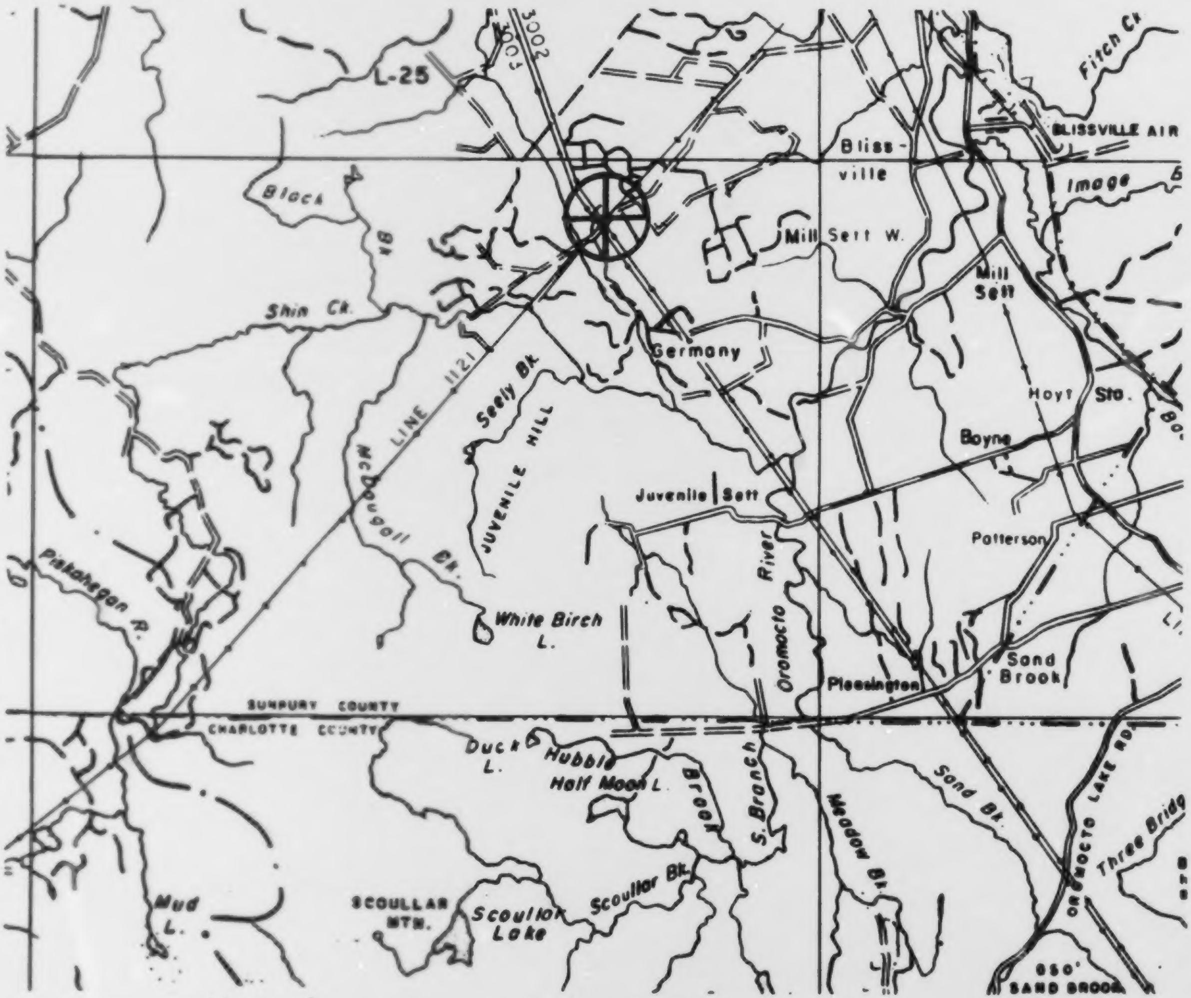
ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R14 **Page 1 of** 4

Locality: Mount Pleasant

Rock Type: Mississippian silicified, phyric, RHYOLITIC TUFF

Location Map:



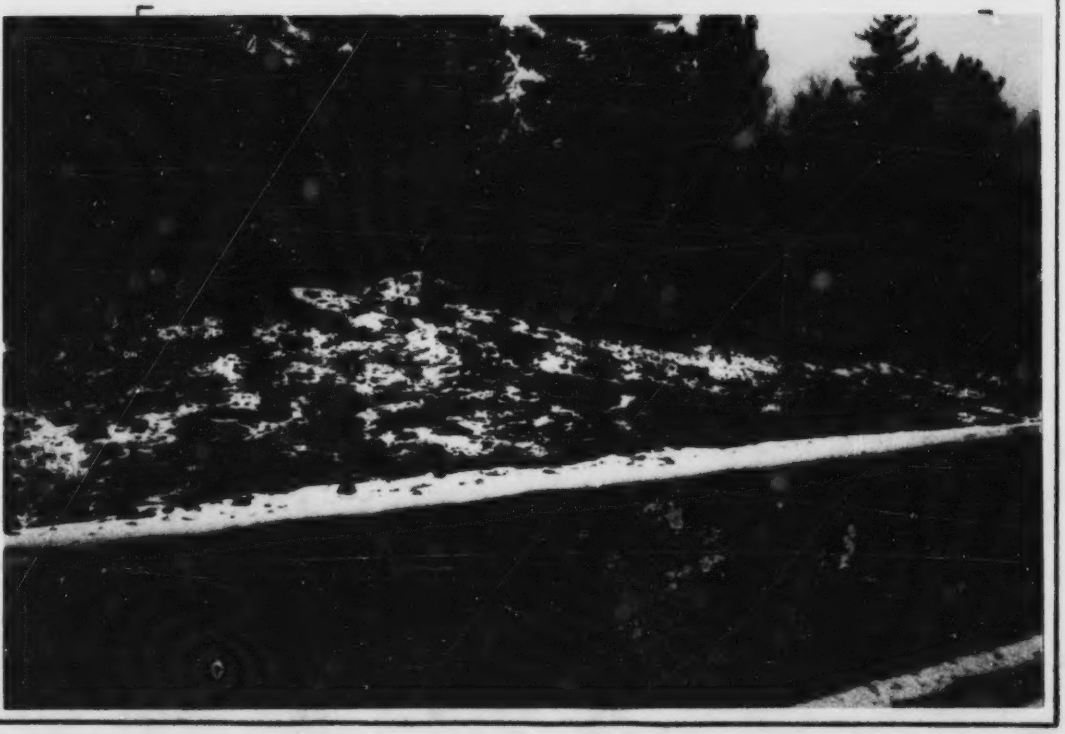
L-25
3002
Black
Bk
Shin Ck.
Fitch Ck
Bliss-ville
BLISSVILLE AIR
Image
Mill Sett W.
Mill Sett
Germany
Hoyt Sta.
Boyne
Seely Bk.
JUVENILE HILL
LINE 1121
McDougall Bk.
Juvenile Sett
Patterson
Piskahegan R.
White Birch L.
Oromocto River
Pleasington
Sand Brook
SUNBURY COUNTY
CHARLOTTE COUNTY
Duck L.
Hubble
Half Moon L.
Brook
S. Branch
Meadow Bk.
Sand Bk.
OROMOCTO LAKE RD
Three Brid
Mud L.
SCOULLAR MTN.
Scoullar Lake
Scoullar Bk.
850'
SAND BROOK

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R14

Page 2 of 4



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R14 **Page** 3 **of** 4

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R14

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ALKALI AGGREGATE REACTION STUDY

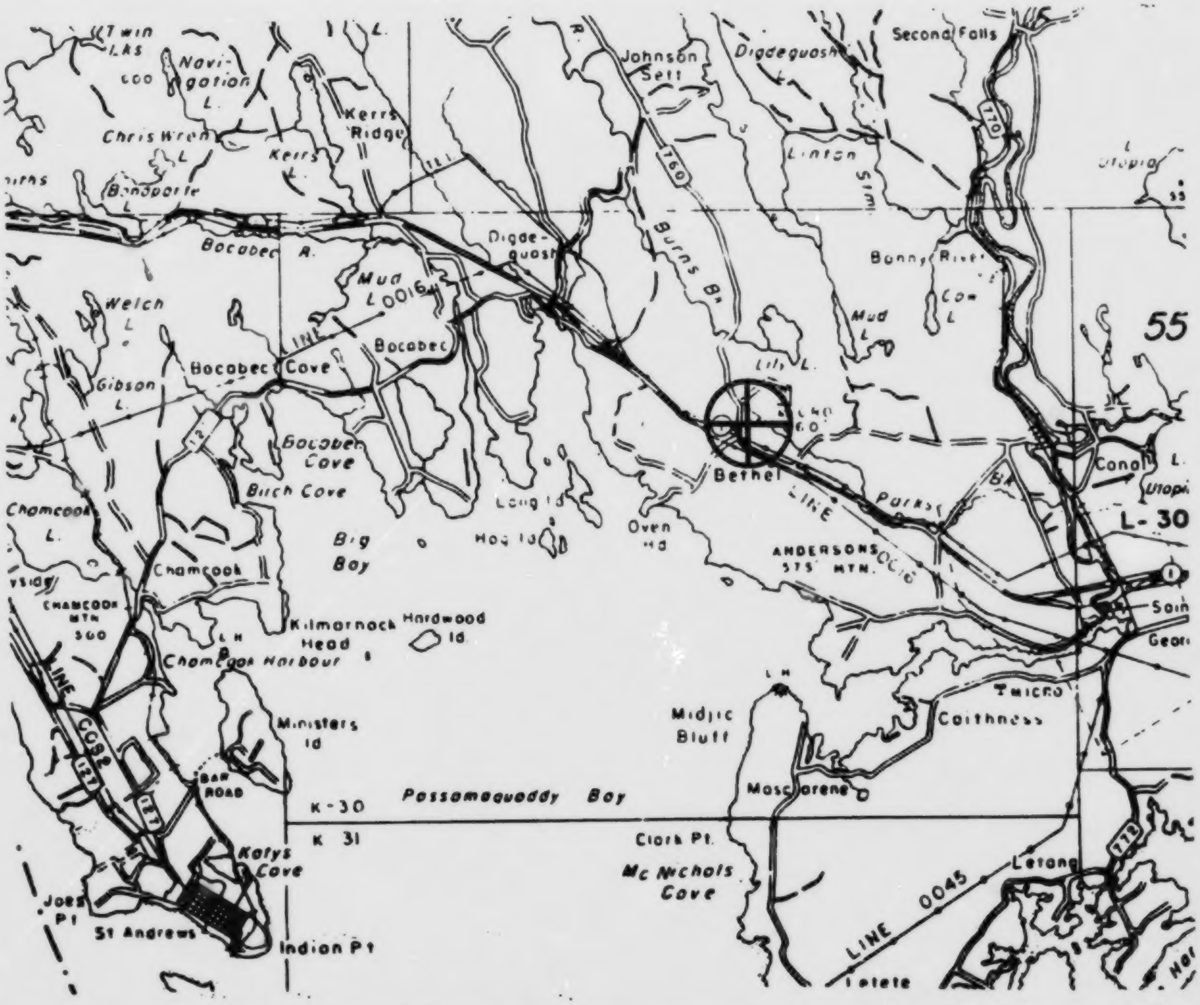
INVENTORY OF ROCK SAMPLES

Sample No: R15 **Page** 1 **of** 3

Locality: BETHEL 300m north of highway 1 junction on east side of highway 760

Rock Type: Silurian/Devonian SILICIC (RHYOLITIC) LAVA

Location Map:


Twin Lks
600
Navigation L.
Chris Wren L
Kerrs Ridge
Kerrs
Bonaparte L
Bocabec R.
Digdeguash
Johnson Sett
Digdeguash
Second Falls
770
760
Linton Stm
Burns Br
Utopia
Bonny River
Welch L
Mud L
L0016
LINE
Bocabec
Bocabec Cove
Gibson L.
Mud L
Lily L.
55
Bocabec Cove
Birch Cove
Long Id
Bethel
LINE
Parkss
Canal
Utopia
L-30
Chamcook L.
Big Bay
Hog Id
Oven Hd
ANDERSONS STS MTN.
0016
1
Chamcook
CHAMCOOK MTN 500
Kilmarnock Head
Hardwood Id
Chamcook Harbour
Midjic Bluff
Caithness
Ministers Id
LINE
CG98
127
BAR ROAD
K-30
K 31
Passamaquoddy Bay
Mascarene
Clark Pt.
Katys Cove
Mc Nichols Cove
Letang
772
Joes Pt
St Andrews
Indian Pt
LINE 0045
Letete

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R15

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ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R15 **Page** 3 **of** 3

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

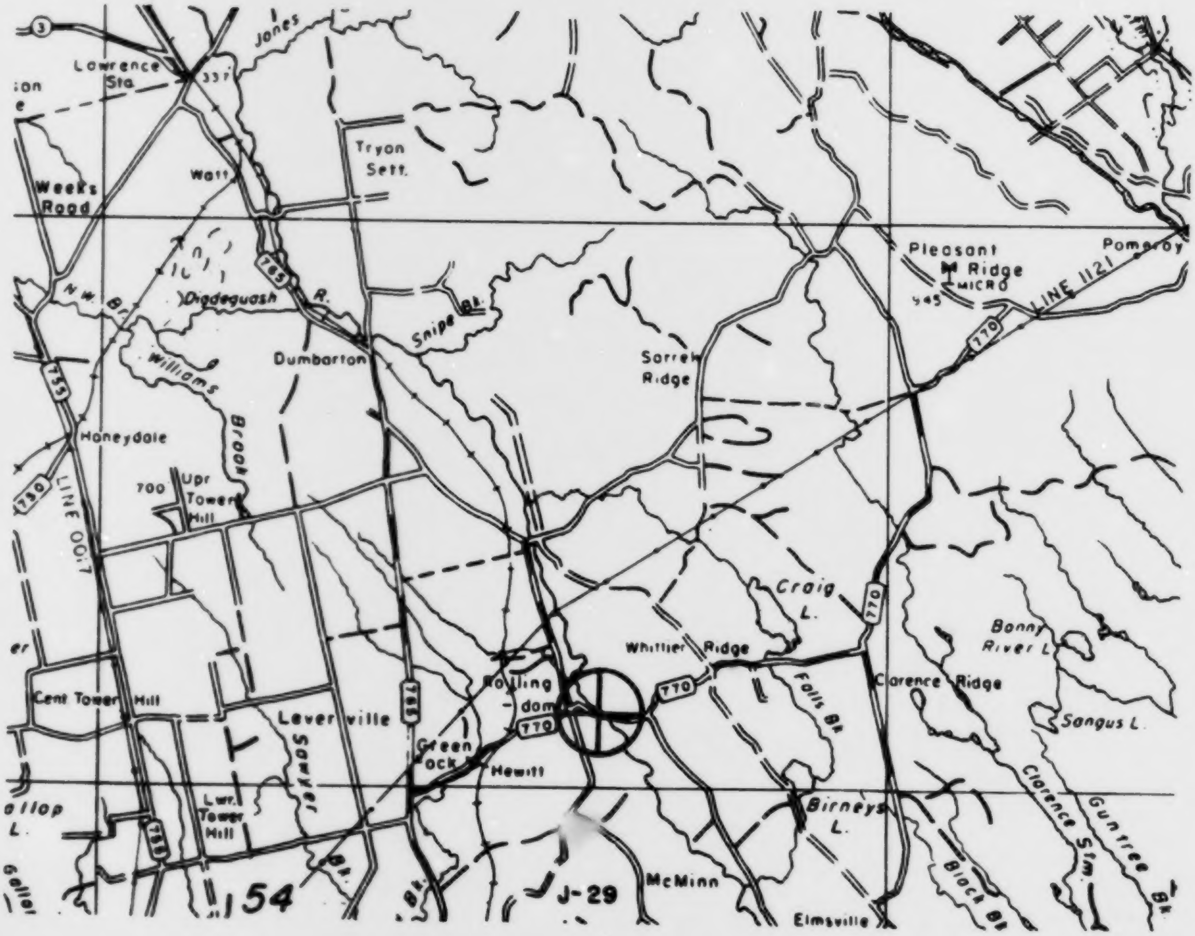
Sample No: R16

Page 1 **of** 3

Locality: ROLLINGDAM, rightbank of Digdeguash River immediately west of covered bridge

Rock Type: Silurian SILICIC FELDSPAR LAVA

Location Map:



3
Jones
Lawrence Sta.
337
Weeks Road
Watt
Tryon Sett.
765
Digdeguash R.
N.W. Br.
Williams Brook
Snipe Bk.
Dumbarton
755
Honeydale
730
LINE 00.7
700
Upr Tower Hill
Sorrel Ridge
Pleasant Ridge
MICRO
545
Pomeroy
LINE 1121
770
Craig L.
Whittier Ridge
Falls Bk
Clarence Ridge
Bonny River L.
Sangus L.
Rolling dam
Green Rock
Hewitt
Leverville
Sawyer Bk.
Cent Tower Hill
Lwr. Tower Hill
Birneys L.
Clarence Stm.
Guntree Bk.
Black Bk
McMinn
Elmsville
J-29
54

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

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ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

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ALKALI AGGREGATE REACTION STUDY

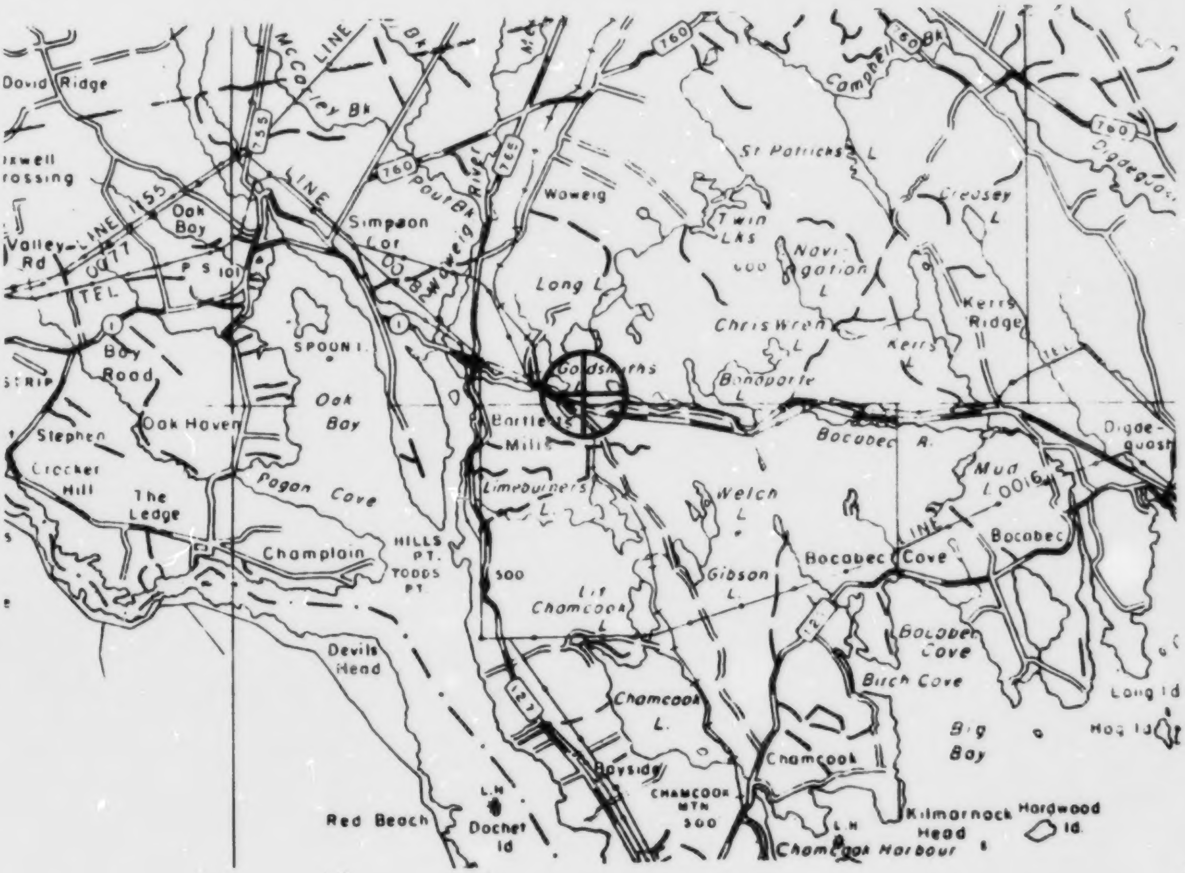
INVENTORY OF ROCK SAMPLES

Sample No: R17 **Page** 1 **of** 2

Locality: BARTLETT'S MILL 0.7 km east of railway intersection on north side of Highway 1

Rock Type: Devonian GRANITE, pink

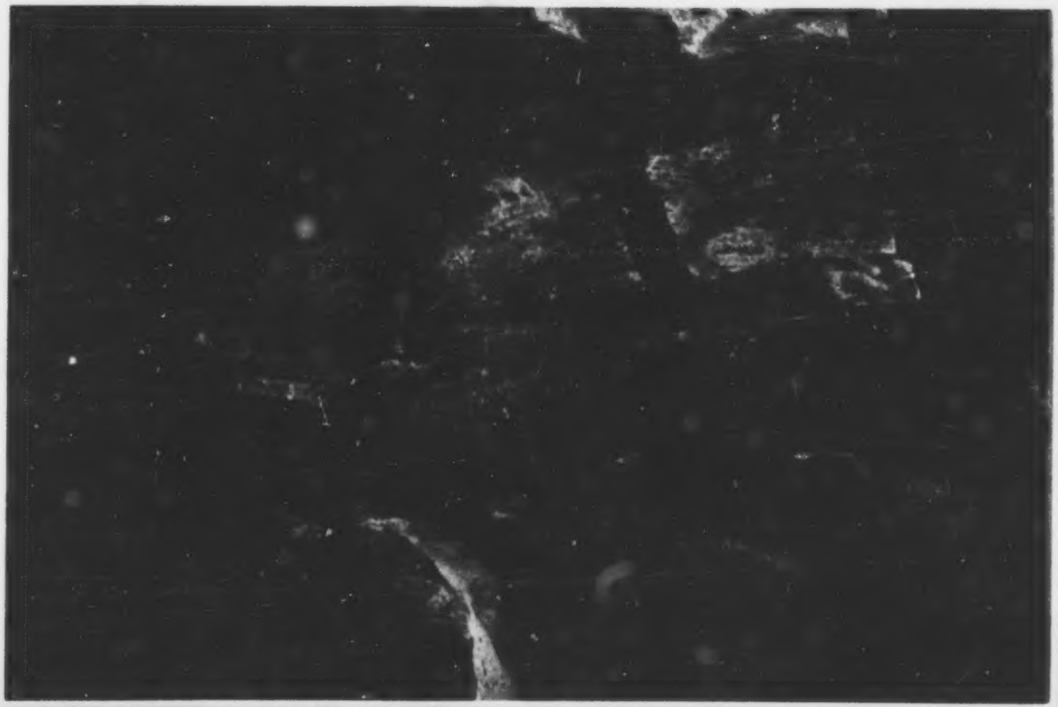
Location Map:


David Ridge
McCauley Bk
LINE
155
760
Oak Bay
Simpson Cor
Valley Rd
TEL
P S 101
Waweig River
Waweig
Pout Bk
Long L
St Patricks L
Twin Lks
Navigation L
Creasey L
Kerrs Ridge
Chris Wren L
Kerrs
Goldsmiths
Bonaparte L
Bartlett Mills
Bay Road
Spoon I.
Oak Bay
Oak Haven
Stephen
Crocker Hill
The Ledge
Pagan Cove
Champlain
Hills Pt.
Todds Pt.
Limeburners L
Welch L
Bocabec R.
Digdeguash
Mud L
Bocabec
Bocabec Cove
Gibson L
500
Lit Chamcook L
Devils Head
Chamcook L.
Bocabec Cove
Birch Cove
Long Id
Hog Id
Big Bay
Bayside
Chamcook
Chamcook Mtn 500
Red Beach
L.H. Dochet Id
L.H.
Kilmarnock Head
Hardwood Id
Chamcook Harbour
Campbell Bk
127

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R17 **Page** 2 **of** 2



ALKALI AGGREGATE REACTION STUDY

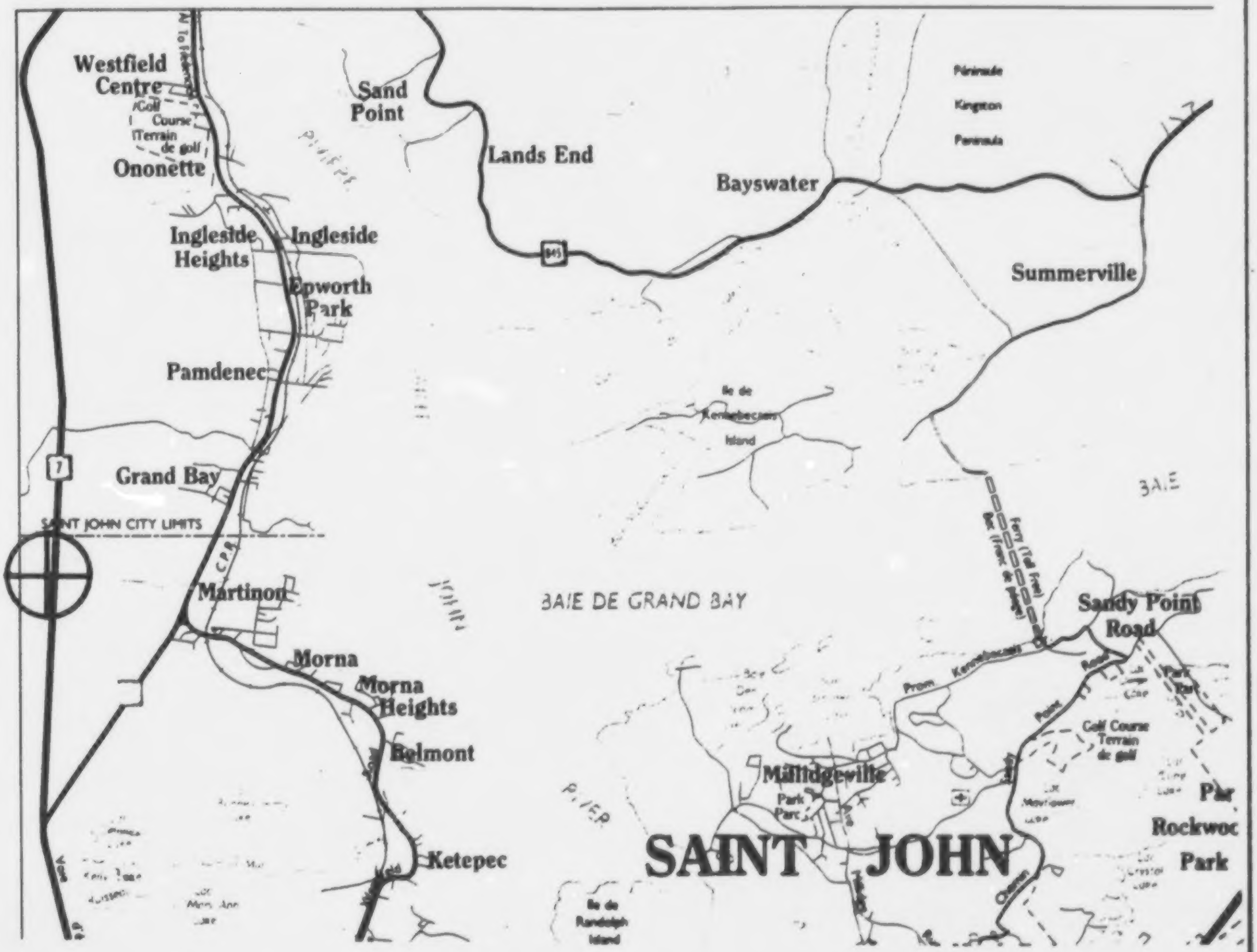
INVENTORY OF ROCK SAMPLES

Sample No: R18 **Page** 1 **of** 3

Locality: GRAND BAY - West side of Highway 7 (Grand Bay Bi-Pass)
2.7 km north of Grand Bay/Martinon Turn-off

Rock Type: Pre-Cambrian GRANITE

Location Map:


Westfield Centre
Golf Course Terrain de golf
Ononette
Sand Point
Lands End
Bayswater
Peninsule Kingston Peninsula
Summerville
Ingleside Heights
Ingleside
Epworth Park
Pamdenec
Grand Bay
7
845
SAINT JOHN CITY LIMITS
C.P.R.
Martinon
Morna
Morna Heights
Belmont
Ketepec
Île de Kennebecasis Island
BAIE DE GRAND BAY
BAIE
Ferry (Toll Free)
Sandy Point Road
Golf Course Terrain de golf
Millidgeville
Park Parc
RIVER
SAINT JOHN
Île de Randolph Island
Rockwood Park

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R18

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R18

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

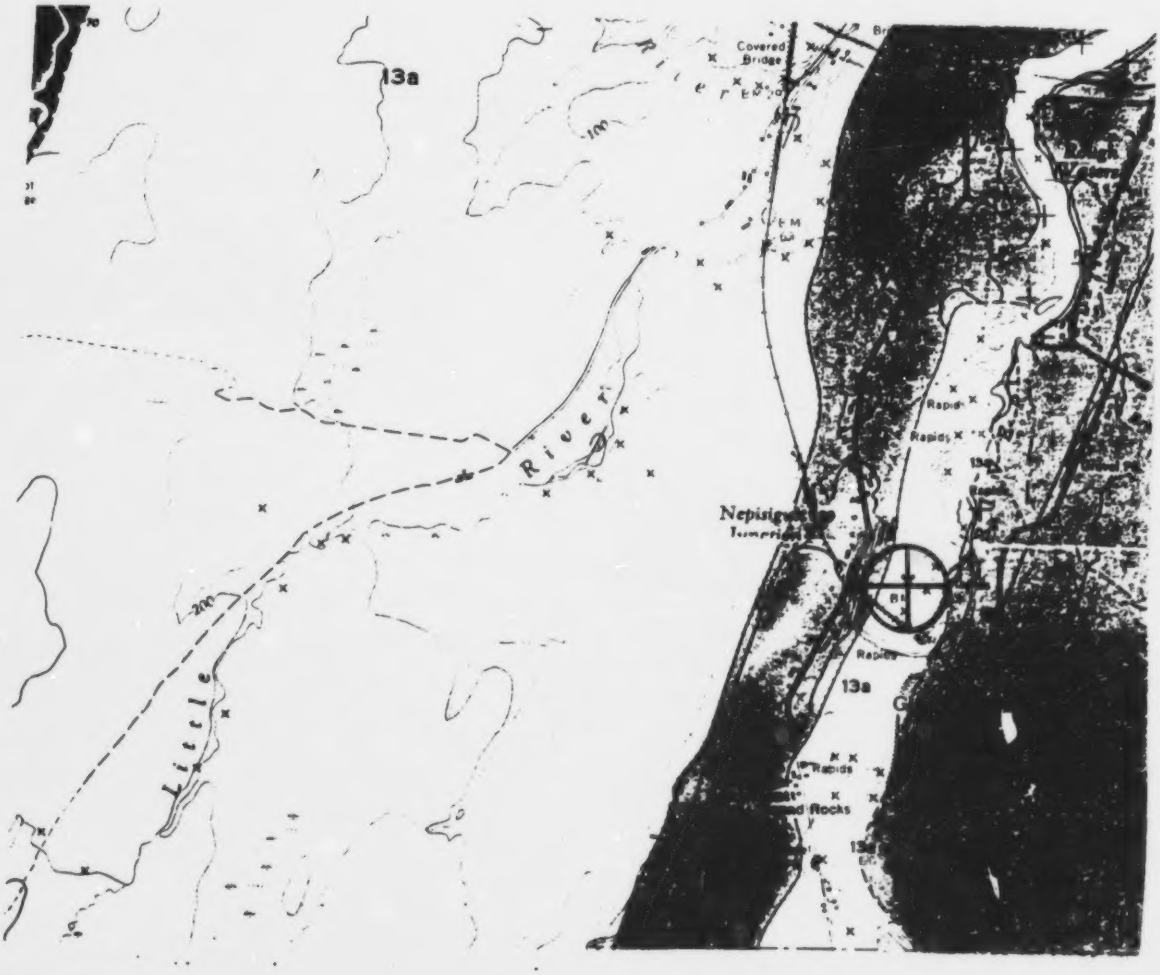
Sample No: R19

Page 1 **of** 4

Locality: CONNOLLY QUARRY, 5 Km south of Bathurst, 475 metres east of the Mines Road

Rock Type: (Middle) Devonian QUARTZ MONZONITE

Location Map:


13a
Covered Bridge
River
100
River
200
Little
Nepisiguit Junction
Rapids
Rapids
R1
Rapids
13a
Rapids
Grand Rocks
13a

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R19

At reconnaissance stage

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R19

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At time of sampling

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R19 **Page** 4 **of** 4

At time of sampling

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

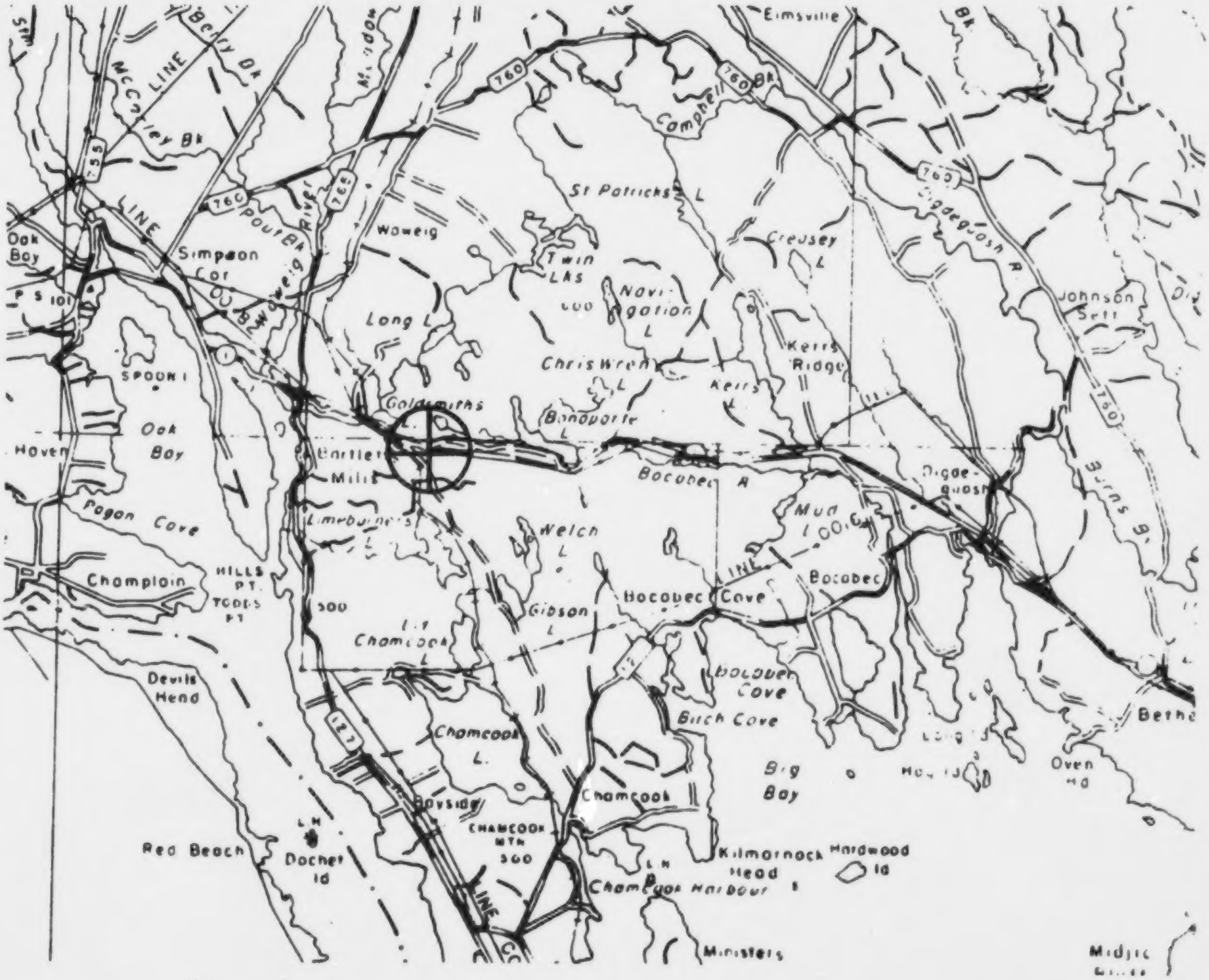
Sample No: R20

Page 1 **of** 2

Locality: BARTLETT'S MILLS, 1.0 km east of railway intersection on south side of Highway 1

Rock Type: Devonian Quartz GABBRO

Location Map:

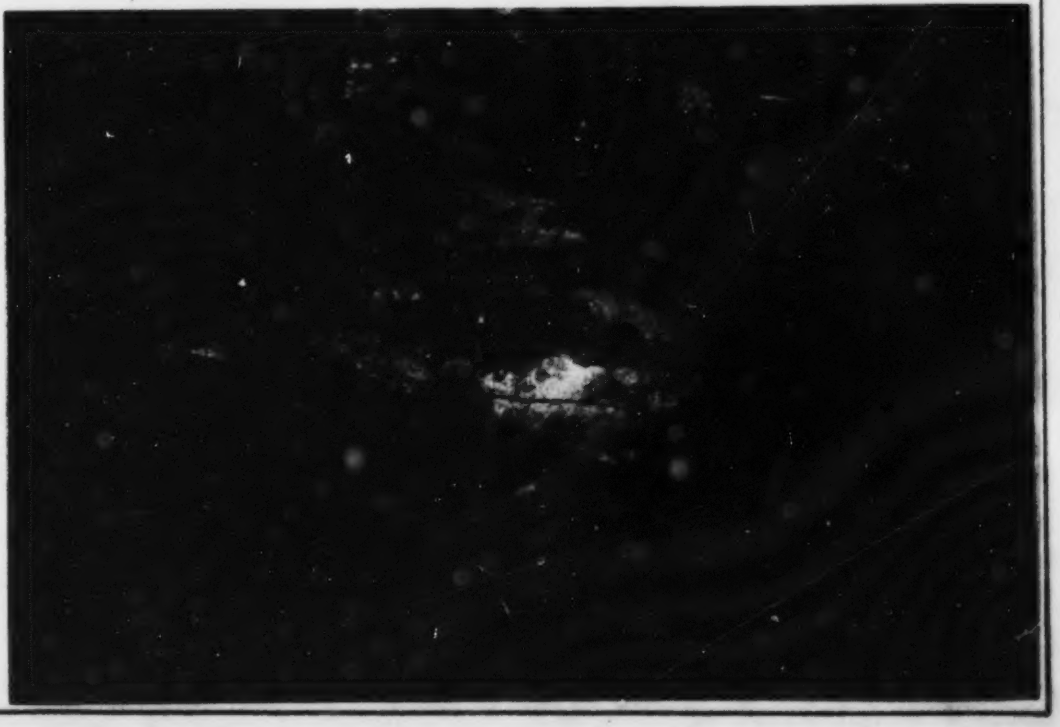

Elmsville
McCauley Bk
LINE
760
765
Campbell Bk
St Patricks L
Oak Bay
Simpson Cor
Waweig
Twin LKS
Navigation L
Creasey L
Digdeguash R
Johnson Sett
Long L
Chris Wren L
Kerrs Ridge
Goldsmiths L
Bonaparte L
Havens
Oak Bay
Bartlett Mills
Bocabec R
Digdeguash
Pagan Cove
Limeburners L
Welch L
Mud L
Champlain
Bocabec Cove
Bocabec
Gibson L
Chamcook L
Devils Head
Bocabec Cove
Birch Cove
Chamcook L
Big Bay
Oven Hd
Bayside
Red Beach
Dochet Id
Chamcook
Kilmarnock Head
Hardwood Id
Chamcook Harbour
Ministers

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R20

Page 2 **of** 2



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

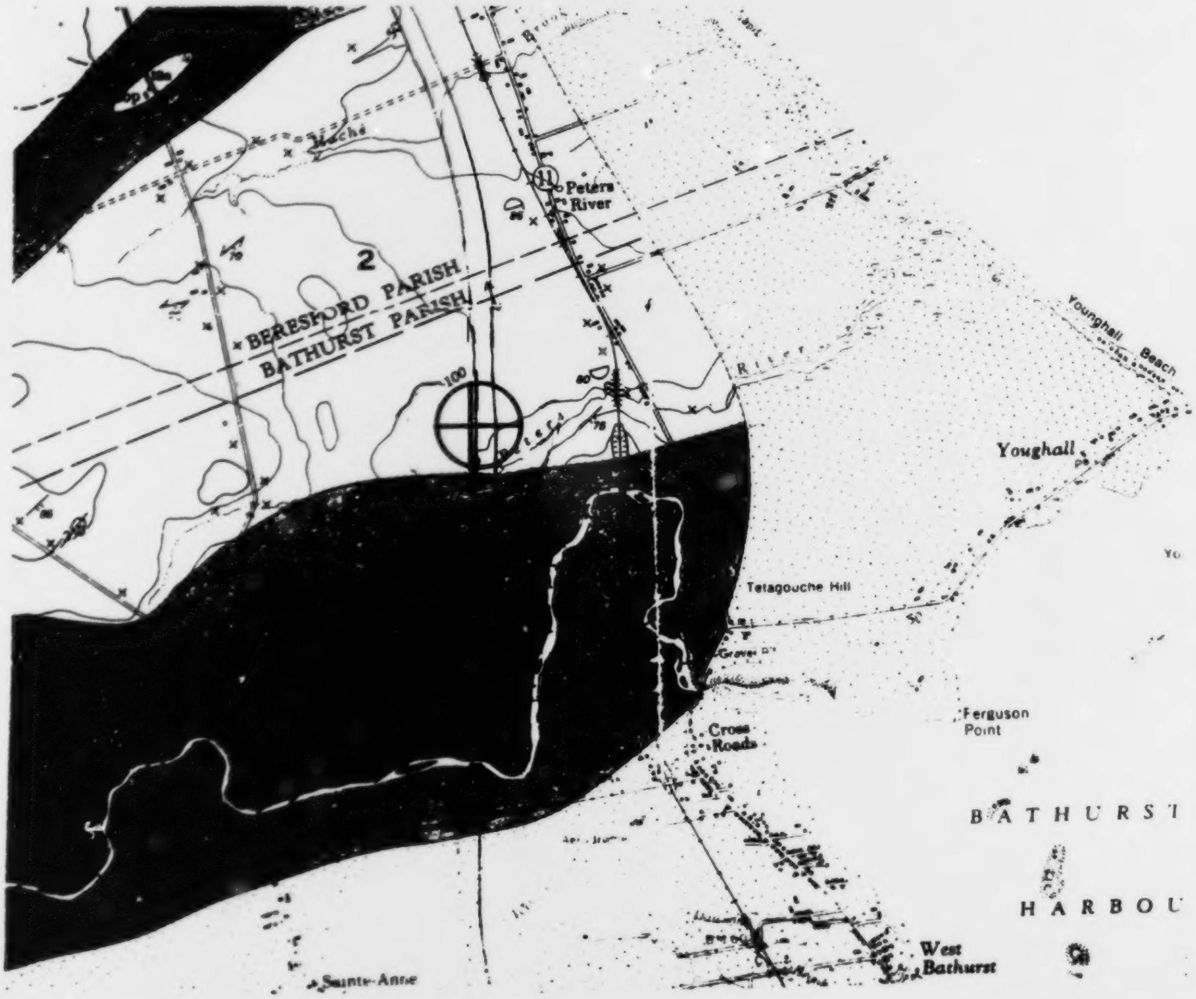
Sample No: R21

Page 1 **of** 3

Locality: BERESFORD 2.5 km North of Vanier Highway on west side of (the new) Highway 11

Rock Type: (Middle) Ordovician phyric, chloritized BASALT
Tetagouche Group

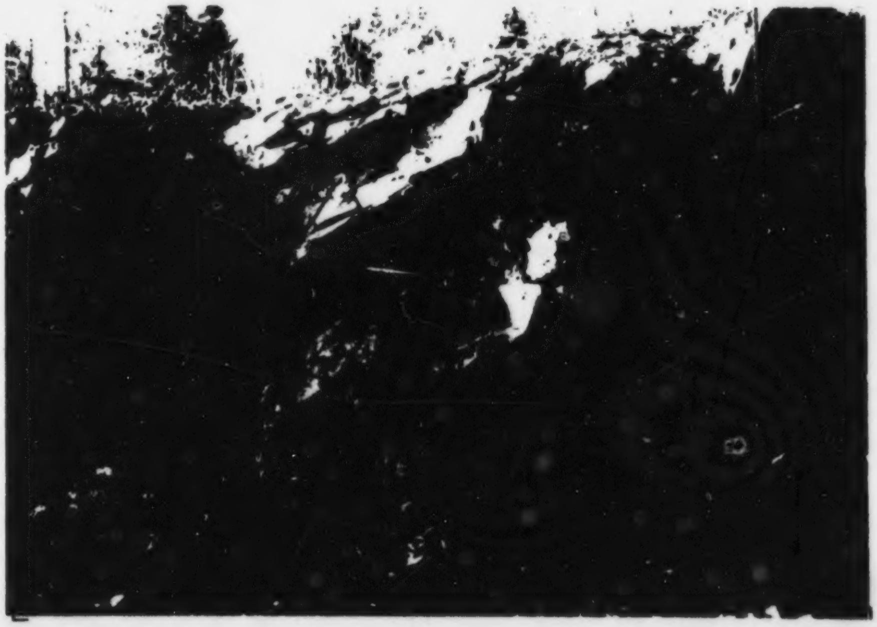
Location Map:


11
Peters River
2
BERESFORD PARISH
BATHURST PARISH
100
River
Youghall Beach
Youghall
Tetagouche Hill
Cross Roads
Ferguson Point
BATHURST
HARBOU
West Bathurst
Sainte-Anne

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R21



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INVENTORY OF ROCK SAMPLES

Sample No: R21

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ALKALI AGGREGATE REACTION STUDY

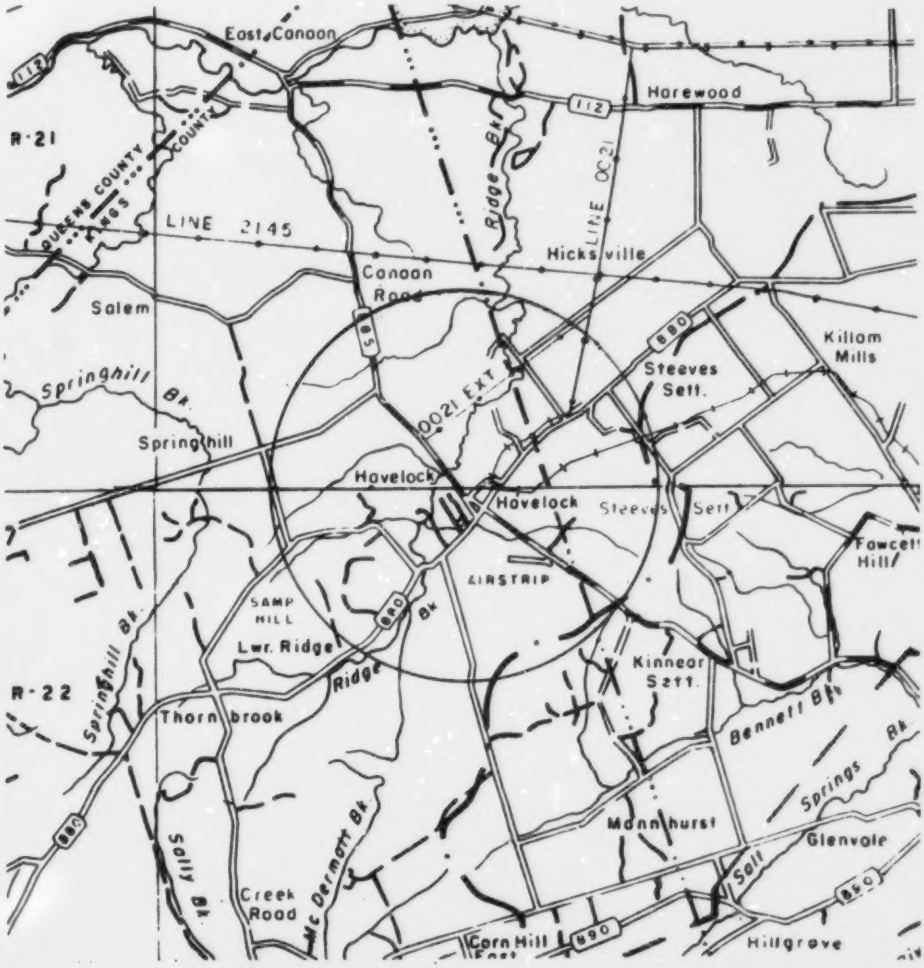
INVENTORY OF ROCK SAMPLES

Sample No: R22 **Page** 1 **of** 4

Locality: HAVELOCK Quarry

Rock Type: Mississippian LIMESTONE

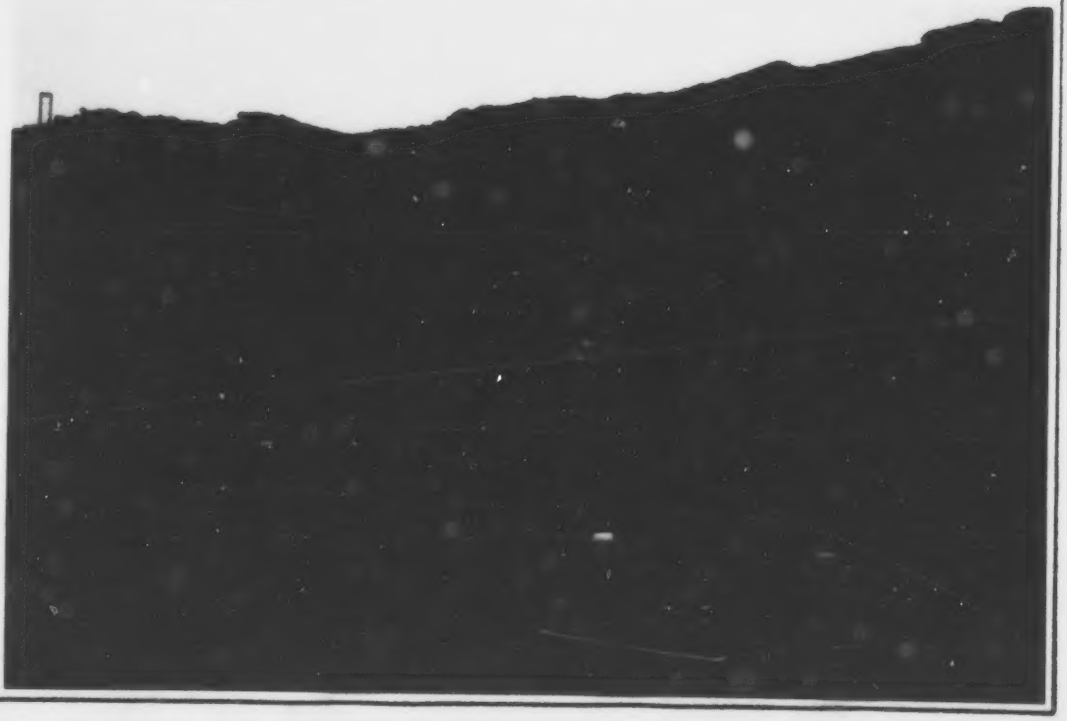
Location Map:


East Canaan
112
Harewood
R-21
QUEENS COUNTY
KINGS
COUNTY
Ridge Bk
LINE 0021
LINE 2145
Hicksville
Canaan Road
Salem
85
890
Killam Mills
Steeves Sett.
Springhill Bk
0021 EXT
Springhill
Havelock
Havelock
Steeves Sett
Fawcett Hill
AIRSTRIP
SAMP HILL
890
Bk
Lwr. Ridge
Ridge
Kinnear Sett.
R-22
Springhill Bk
Thornbrook
Bennett Bk
Springs Bk
890
Sally Bk
McDermott Bk
Mannhurst
Glenvale
Salt
Creek Road
890
Corn Hill East
890
Hillgrove

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R22 **Page** 2 **of** 4



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R22

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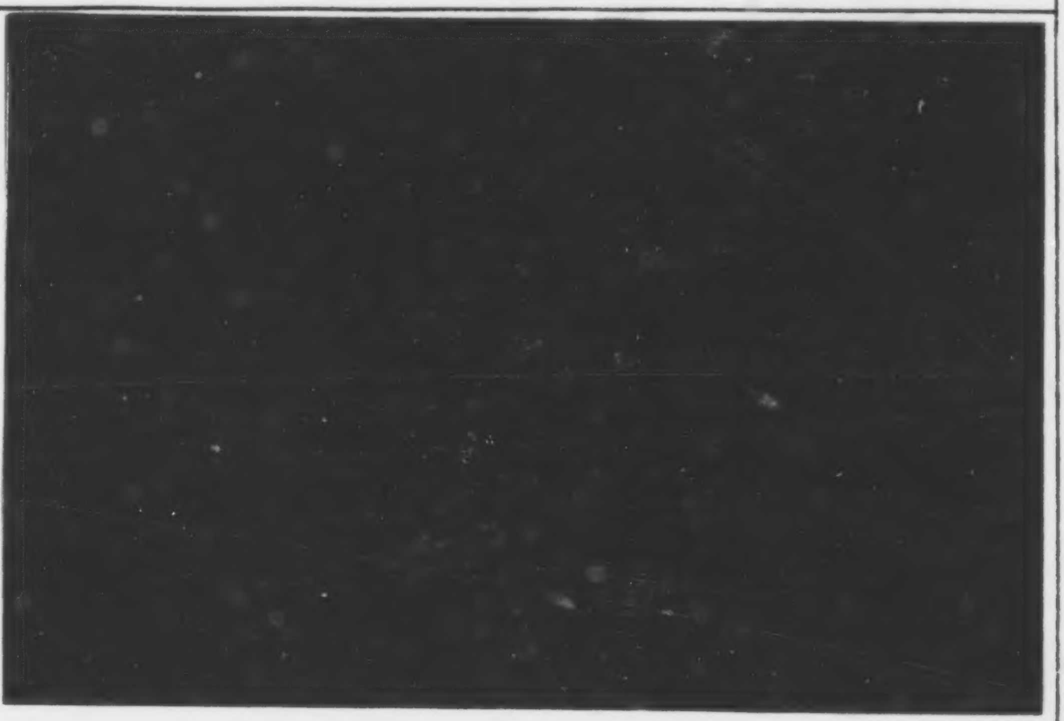

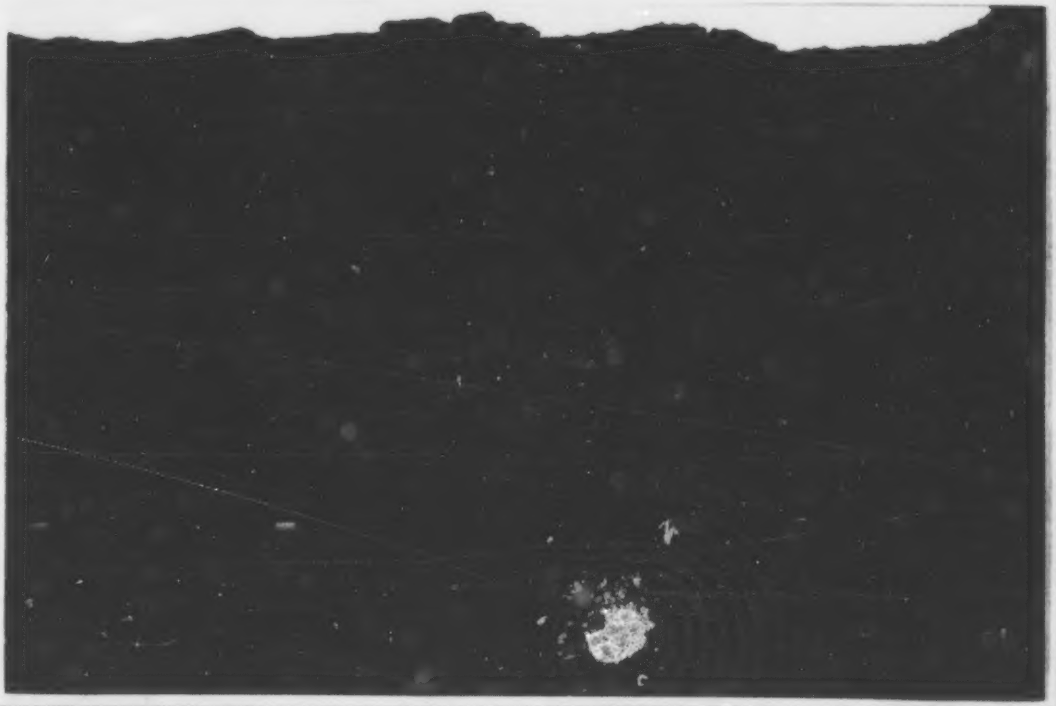

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R22

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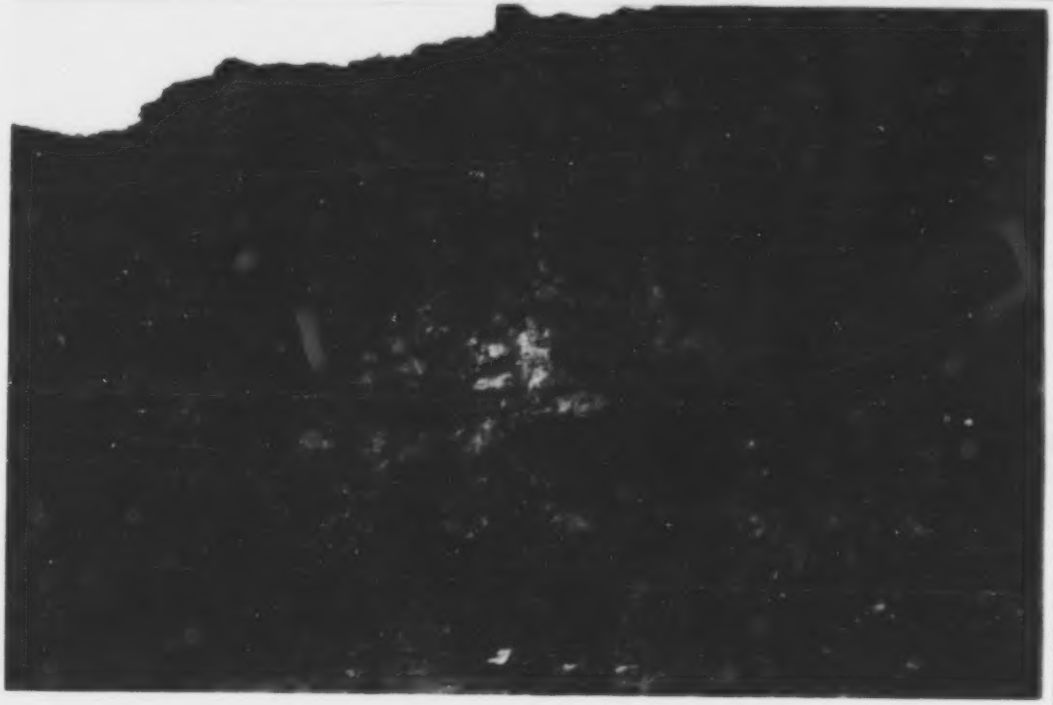


ALKALI AGGREGATE REACTION STUDY

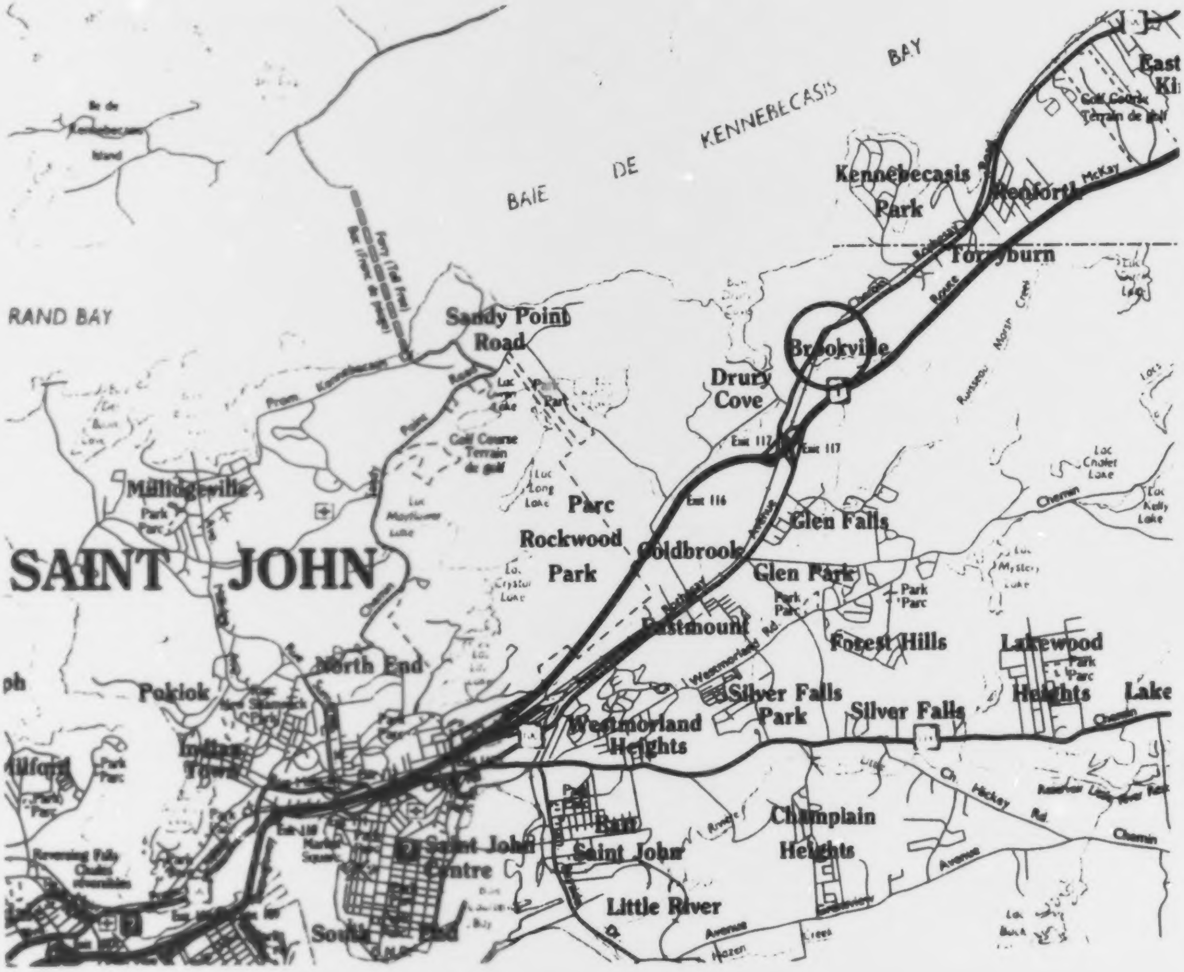
INVENTORY OF ROCK SAMPLES

Sample No: R23 **Page** 1 **of** 3

Locality: BROOKVILLE QUARRY, Saint John

Rock Type: Pre Cambrian DOLOMITE

Location Map:



BAIE DE KENNEBECASIS BAY
RAND BAY
Kennebecasis Island
Kennebecasis Park
Renforth
Fairvale
Brookville
Drury Cove
Sandy Point Road
Parc Rockwood Park
Coldbrook
Glen Falls
Glen Park
Eastmount
Forest Hills
Lakewood Heights
Silver Falls Park
Silver Falls
Westmorland Heights
Millidgeville
SAINT JOHN
North End
Pokiok
Indian Town
Milford
Saint John Centre
East Saint John
Champlain Heights
Little River
South End
Golf Course Terrain de golf
Exit 117
Exit 116

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R23

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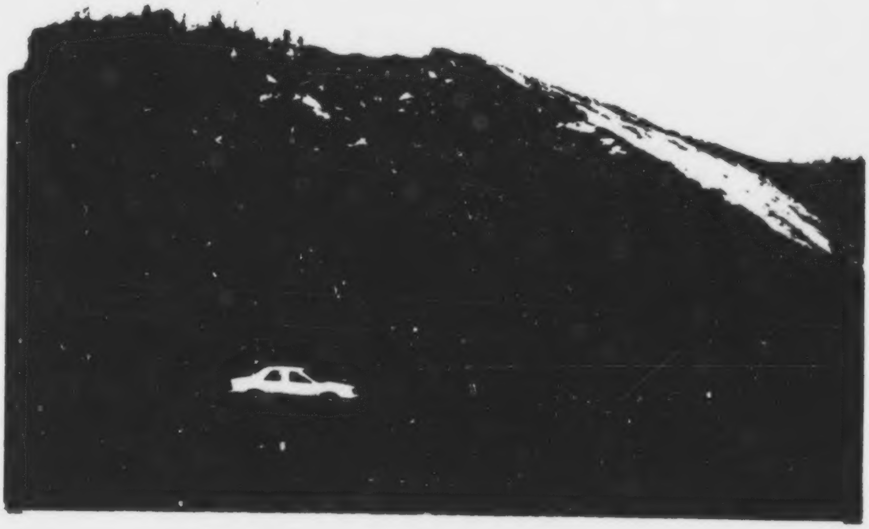
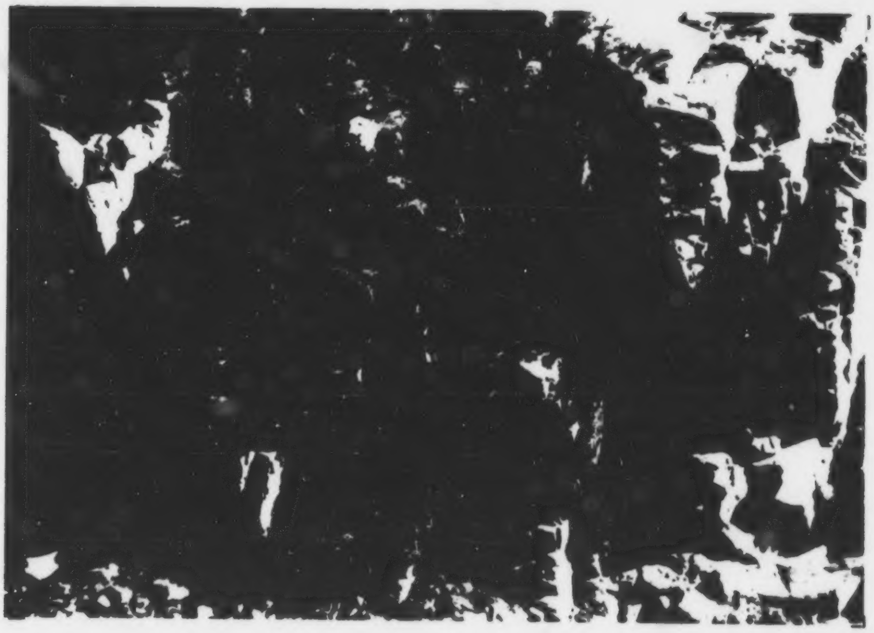


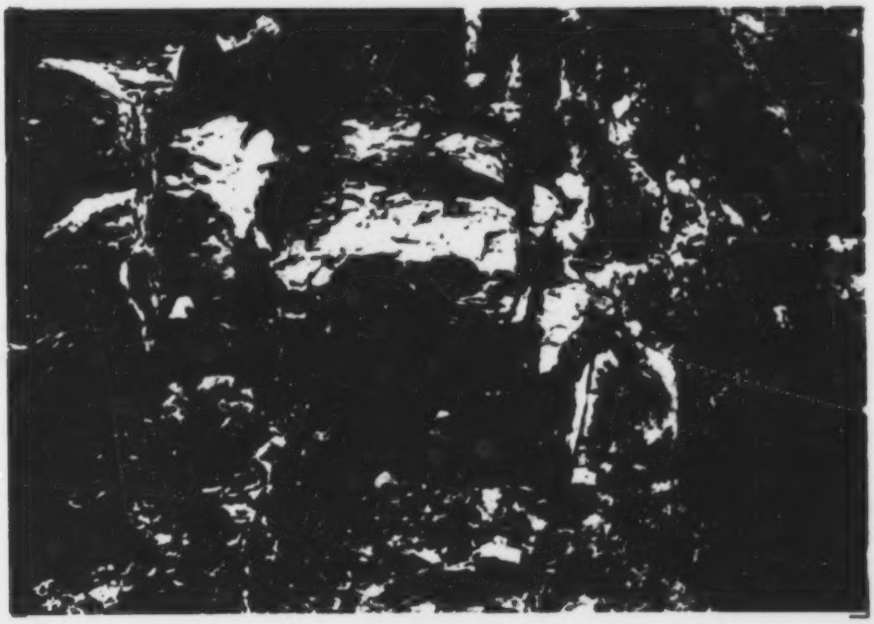


At time of sampling

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R23 **Page** 3 **of** 3



ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

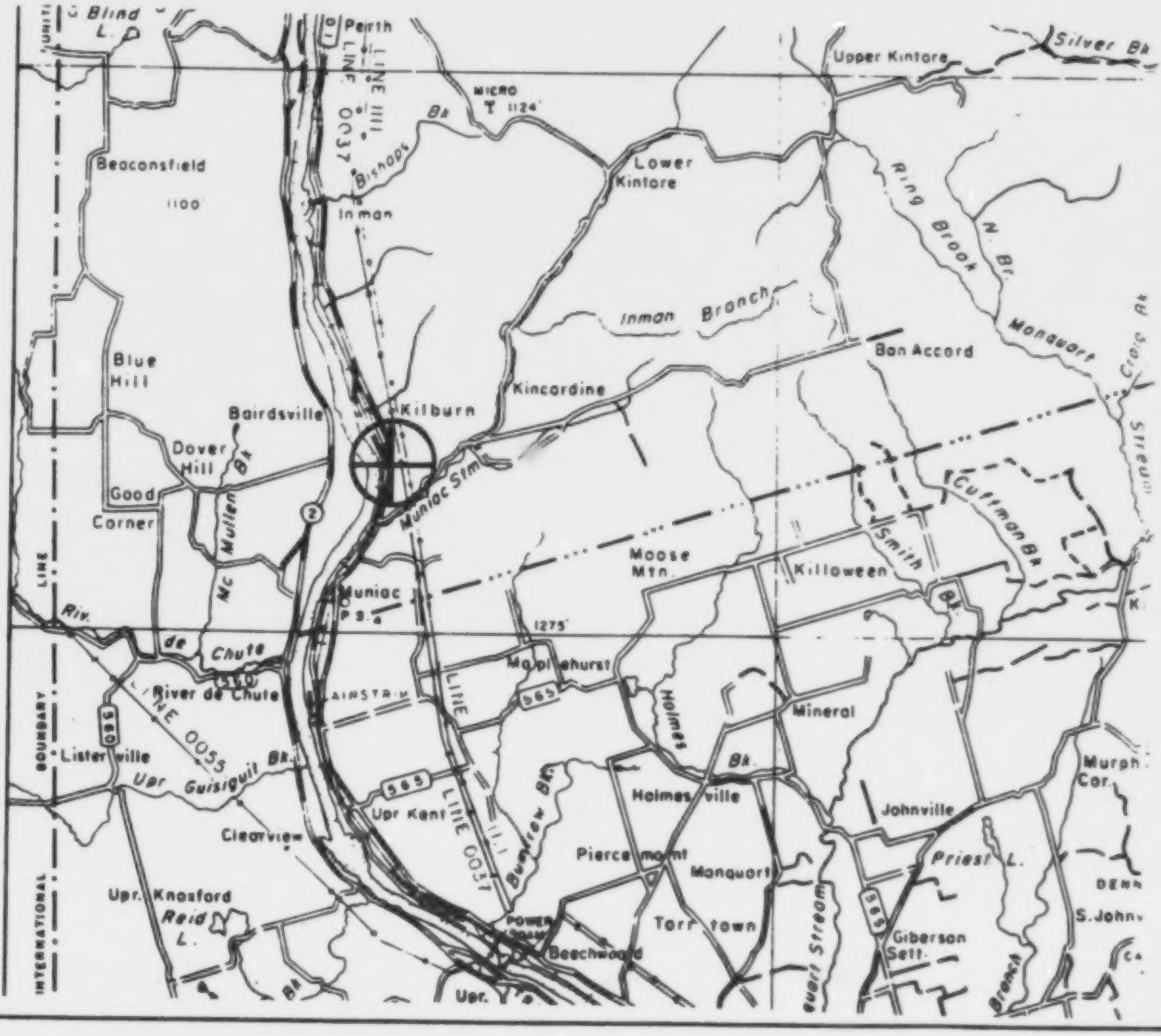
Sample No: R24

Page 1 **of** 2

Locality: MUNIAC 0.6 km north of Muniac turn-off, on east side of Hwy 105

Rock Type: Ordovician or Silurian LIMESTONE Mid grey

Location Map:


Blind L.
Perth
LINE 0037
LINE IIII
MICRO
1124'
Bishops Bk
Upper Kintore
Silver Bk
Lower Kintore
Beaconsfield
1100'
Inman
Ring Brook
N. Br.
Inman Branch
Monquart
Craig Bk
Bon Accord
Blue Hill
Kincardine
Bairdsville
Kilburn
Dover Hill
Good Corner
Mc Mullen Bk
Muniac Stm
Cuttman Bk
Smith Bk
Moose Mtn.
Killoween
Muniac P.S.
1275'
Riv. de Chute
River de Chute
Maplehurst
LINE 0053
Mineral
Listerville
Upr Guisiguit Bk.
Upr Kent
Holmes Bk.
Holmesville
Johnville
Murph. Cor.
Clearview
LINE 0037
Buckley Bk.
Piercemont
Monquart
Priest L.
Upr. Knoxford
Reid L.
Torrtown
Giberson Sett.
S. John
Beechwood
POWER
Upr.
Branch
Stream
INTERNATIONAL BOUNDARY LINE
2
560
565
585

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

Sample No: R24

Page 2 **of** 2

ALKALI AGGREGATE REACTION STUDY
INVENTORY OF ROCK SAMPLES

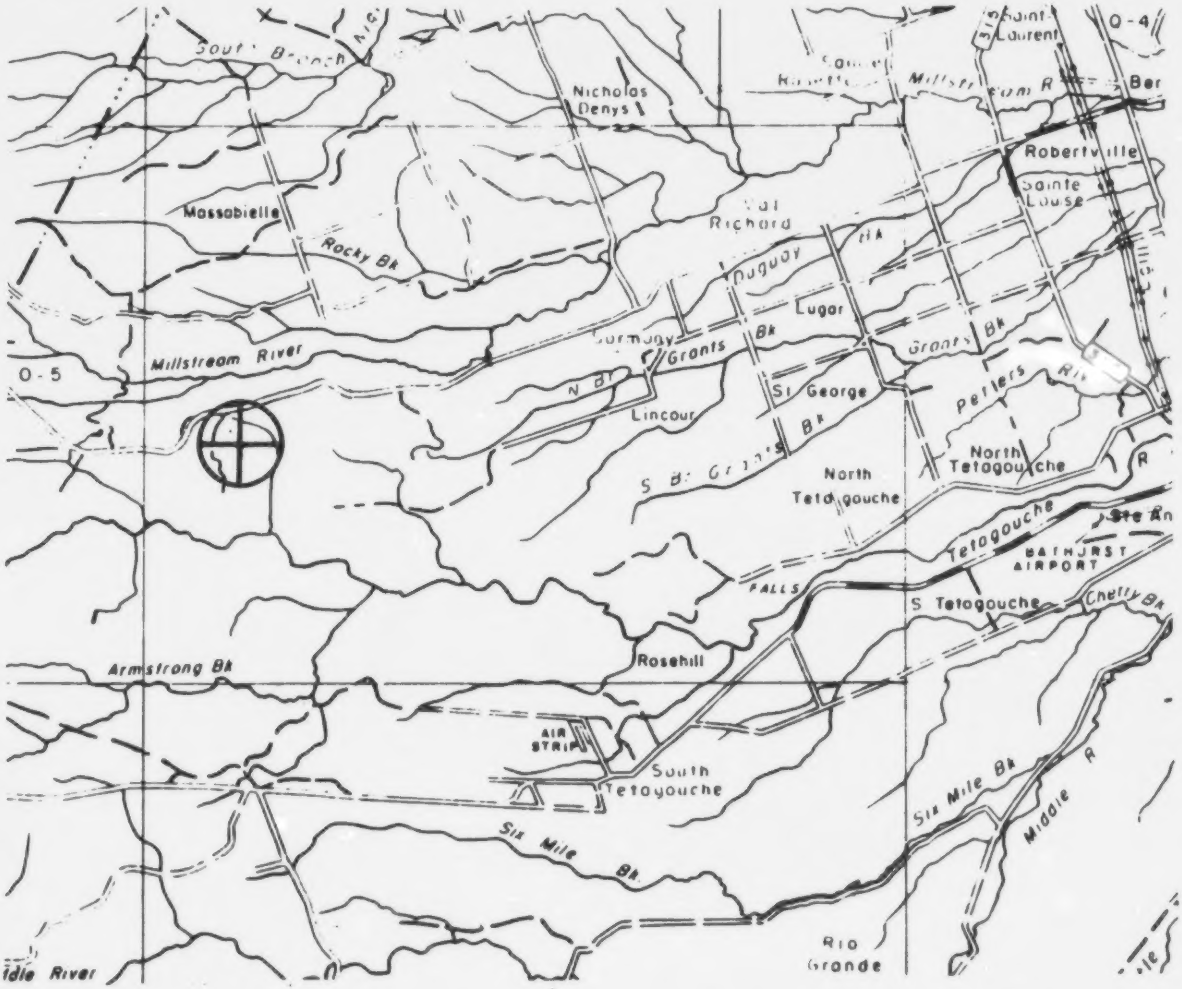
Sample No: R25

Page 1 **of** 3

Locality: SORMANY

Rock Type: LIMESTONE

Location Map:



South Branch
Nicholas Denys
315
Saint-Laurent
O-4
Millstream R
Ber
Robertville
Sainte Louise
Massabielle
Val Richard
Rocky Bk
Duguay
Lugar
Sormany
Grants Bk
Millstream River
O-5
N Br
Lincour
St George
Peters Riv
North Tetagouche
S. Br. Grants Bk
R
Tetagouche
Ste An
BATHURST AIRPORT
FALLS
S Tetagouche
Chetty Bk
Rosehill
Armstrong Bk
AIR STRIP
South Tetagouche
Six Mile Bk
Middle R
Rio Grande
idle River

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R25

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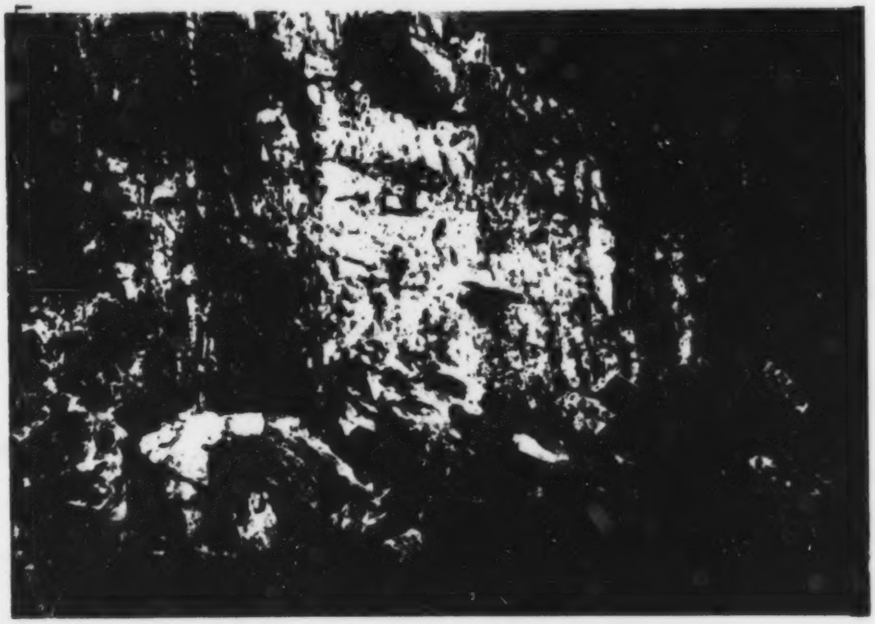

ALKALI AGGREGATE REACTION STUDY

INVENTORY OF ROCK SAMPLES

Sample No: R25

CONTRACT SERIAL NUMBER OSQ85-00187
CONTRACTOR: ADI LIMITED
DSS REQUISITION NUMBER 23440-4-9236
APPENDIX F2

STUDY OF THE ALKALI REACTIVITY OF POTENTIAL CONCRETE AGGREGATES OF NEW BRUNSWICK

APPENDIX F2

RPC REPORT
PETROGRAPHY OF TWENTY-FIVE ROCK TYPES FROM NEW BRUNSWICK

64 pp

RPC REPORT
PETROGRAPHY OF TWENTY-FIVE ROCK TYPES FROM NEW BRUNSWICK - APPENDIX F2

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Same Report

Appendix F

rpc

research and productivity council
conseil de recherche et de productivité

July 14, 1987

RECEIVED
JUL 15 1987
ADI LIMITED

Mr. D. DeMerchant
ADI Limited
1135 Regent Street
Fredericton, New Brunswick
E3B 4Y2

Dear Mr. DeMerchant:

Please find enclosed a final report on the petrographic examination of 25 rock samples from New Brunswick.

Should you have any comments regarding the data presented in the report, please contact me at 452-8994, ext. 315.

Sincerely yours,

Lech Lewczuk
Petrologist

LL/mb/LETT

P.O. Box 6000, Fredericton, New Brunswick, Canada E3B 5H1 • Telephone 506 452-8994 • Telex 014-46115 • Cable Reprodco—Fredericton

DATE:	June 22, 1987
MINERALOGICAL REPORT:	M/87/012
JOB NUMBER:	08200828/0000
SUBMITTED BY:	ADI Limited Box 44, Station "A" Fredericton, N. B. E3B 4Y2

PETROGRAPHY OF TWENTY-FIVE ROCK TYPES FROM NEW BRUNSWICK

Prepared by: Lech Lewczuk
Petrologist

LL/mb/MINRE2

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2.0 EXAMINATION 2

3.0 RESULTS 3-57

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1.0 INTRODUCTION

The Department of Mineral Development and Processing of the Research and productivity Council was requested by ADI Limited to perform detailed petrographic examination of twenty-five rock samples.

The objective of the examination was to identify types of rocks, their mineral composition and texture, with a particular attention paid to the finest mineral phases present in their groundmass.

2.0 EXAMINATION

A polished thin section was produced from each sample. The thin sections were examined using an Optical Microscope and an Electron Probe Micro Analyzer.

The phyllosilicates that occur in the examined samples were identified using X-ray diffraction techniques.

The data generated during the course of the examination are reported in the form of short descriptions of each sample. The descriptions contain the results of visually conducted modal analysis and textural features of the groundmass. Photomicrographs of relevant features from the point of view of the alkali-aggregate reaction are included in each description.

The sample denominations consist of a prefix "ADI" and a number. The sample numbers correspond to those that may be found in "Table 1 - Proposed Sampling and Testing Schedule - Aggregates from Bedrock Samples" by ADI Ltd.

3.0 RESULTS

Sample ADI-1

Type of rock: slate, meta-argillite (siltstone)

Modal analysis:
85% - phyllosilicates (sericite, chlorite)
13% - quartz
2% - pyrite, magnetite, sphene, zircon, calcite, K-feldspar.

Average size of the flakes of the phyllosilicates: 0.03 mm

Texture: thinly laminated, with a few silty laminae not exceeding 0.2 mm in thickness. Maximum size of the grains of quartz is 0.02 mm (Figure 1). Most of the microcrystalline quartz is intergrown with the flakes of sericite and chlorite (Figure 2). The finest grains of quartz in the sample are about 5 micron across.

Comment: The sampled meta-sediment is characterized by rather uneven grain size, depending on a particular layer. In places it grades into a very fine grained greywacke (quartz wacke).

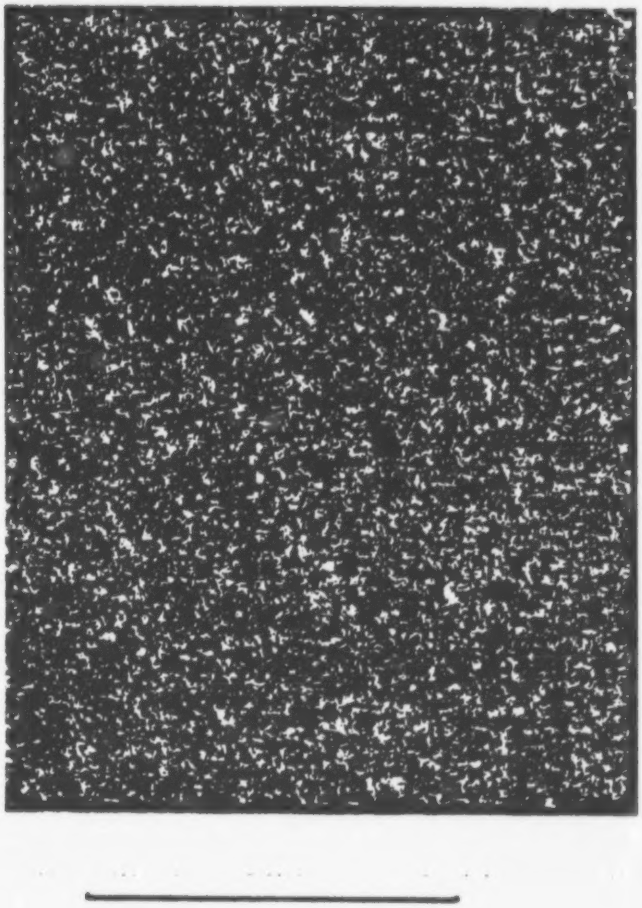

Figure 1
Sample ADI-1

Grain size and texture of the slate.

Optical microscope, crossed nicols.

Length of the bar = 0.4 mm.

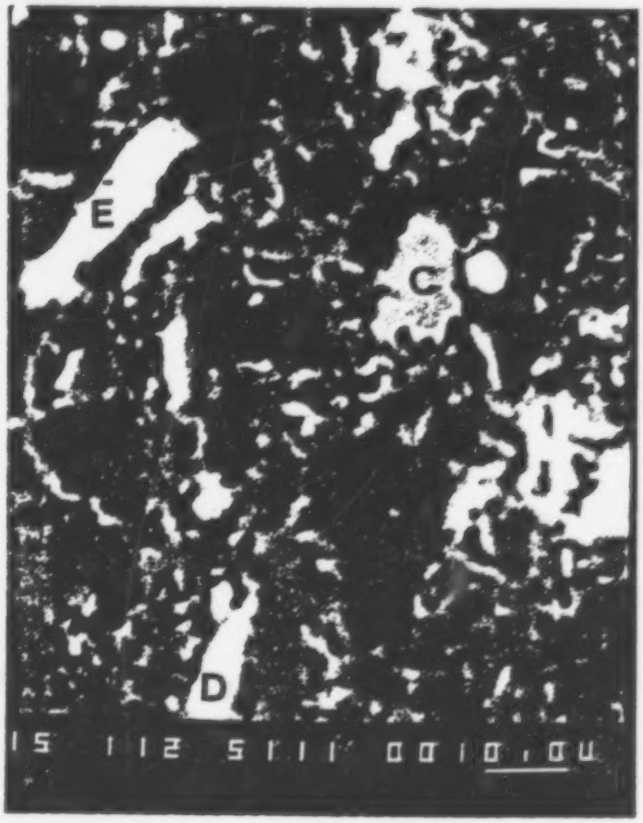

Figure 2
Sample ADI-1

Matrix of the slate. Dark grey is quartz (A), grey is sericite (B), potassic feldspar is marked with (C), calcite with (D) and iron-rich chlorite with (E). White, rounded spots are sphene.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-2

Type of rock: slate, meta-argillite (mudstone)

Modal analysis: 90% - phyllosilicates (sericite, minor chlorite)
8% - quartz
1% - calcite
1% - iron hydroxides, sphene, zircon.

Average size of the grains of phyllosilicates: 0.005 mm

Texture: thickly laminated. Lamination of the meta sediment results from an uneven content of quartz in particular laminae whose thickness is up to 5.0 mm in the examined thin section. Some of the laminae grade into siltstone similar to Sample ADI-1. Finest quartz grains (microcrystalline silica) are 0.001 mm in size (Figure 3). They are intergrown with the flakes of sericite and chlorite.

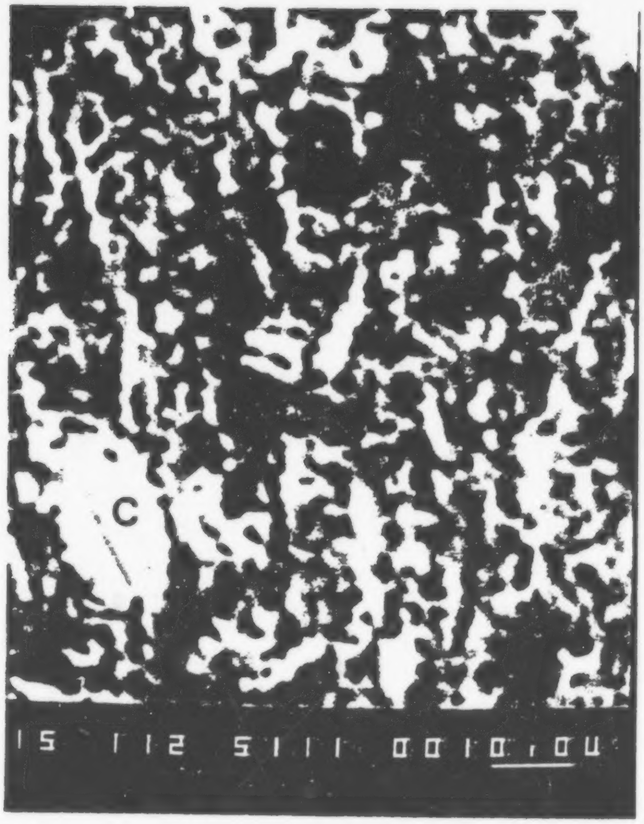

Figure 3
Sample ADI-2

Matrix of the slate. Microcrystalline quartz (A) intergrown with sericite (B) and iron chlorite (C). Black dots are imperfections in polishing. White dots represent zircon and sphene.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-3

Type of rock: slate, meta-argillite (siltstone)

Modal analysis:		
	50% -	quartz
	43% -	phyllosilicates (sericite, chlorite)
	4% -	feldspar
	3% -	calcite, sphene, zircon, magnetite, pyrite.

Average size of the grains of phyllosilicates: 0.04 mm

Texture: thickly laminated. Silty laminae prevail in the examined thin section. Laminae of mudstone are up to 5.0 mm thick. Graded bedding was not observed in the layers of the siltstone (Figure 4). Polycrystalline grains of quartz are elongated in one direction parallel to the foliation of the rock, but quartz does not appear to be strained. Microcrystalline quartz is intimately intergrown with the flakes of phyllosilicates (Figure 5).

Comment: The sampled outcrop contains infrequent layers of a coarse-grained greywacke which in places grades into matrix-supported sandstone.

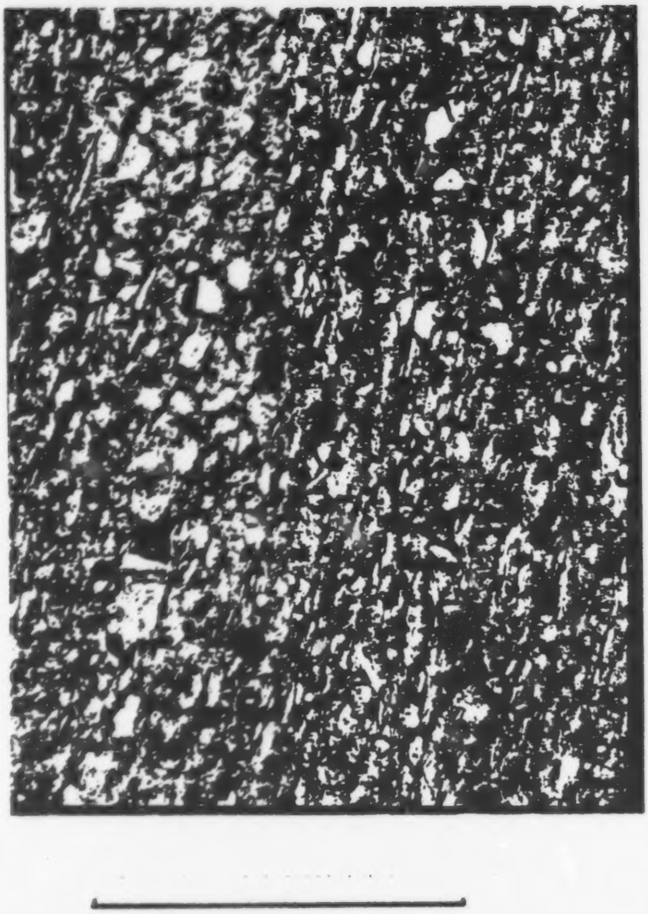

Figure 4
Sample ADI-3

Texture and variations in the grain size of the siltstone.

Optical microscope, crossed nicols.

Length of the bar = 0.3 mm.

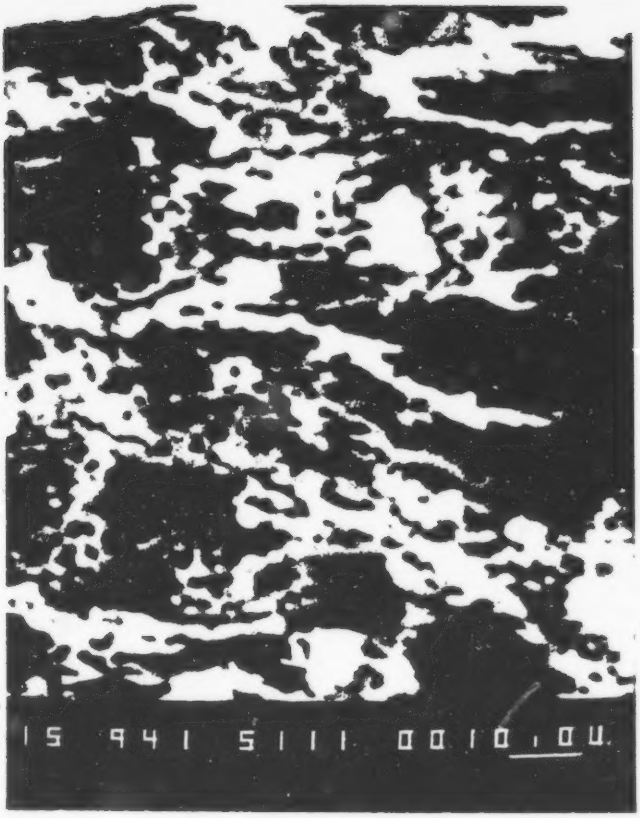

Figure 5
Sample ADI-3

Quartz (A) intergrown with sericite and chlorite (white, light grey). Black are imperfections in polishing.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-4

Type of rock: slate, meta-argillite (siltstone)

Modal analysis:	70%	- phyllosilicates (sericite, minor chlorite)
	25%	- quartz
	3%	- feldspar
	2%	- magnetite, sphene, unidentified rock fragments, pyrite, calcite.

Average size of the grains of phyllosilicates: 0.01 mm

Texture: thinly laminated. Laminae composed of phyllosilicates only (mudstone) are up to 0.1 mm thick. Some of these laminae contain numerous cubes of pyrite whose average size is 0.05 mm. Coarser grained, silty laminae prevail in the thin section examined, but one can expect that the phyllosilicates/quartz ratio in the sample is very unstable. Some of the microcrystalline quartz grains are as small as 0.001 mm (Figure 6).

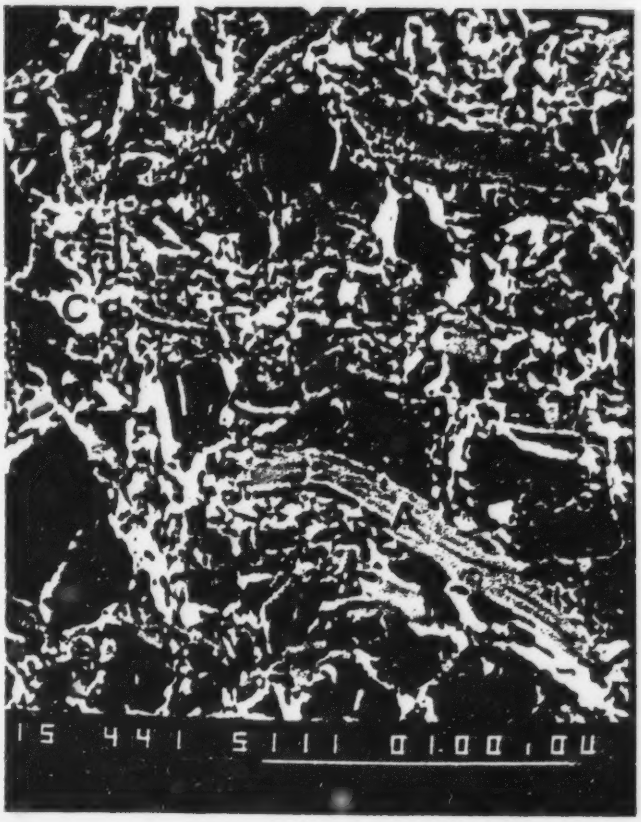

Figure 6
Sample ADI-4

Matrix of the siltstone. Flakes of sericite (A) intergrown with quartz (B) and iron-rich chlorite (C). Arrowed is fine intergrowth of sericite and quartz (dark grey).

Backscattered electron image
Length of the bar = 100 microns

Sample ADI-5

Type of rock: schist

Modal analysis:
45% - quartz
30% - feldspars (microline, albite)
12% - Fe-chlorite
5% - muscovite
3% - epidote
3% - titanomagnetite, sphene, apatite, leucoxene, pyrite.

Texture: foliated, laminated. Ellipsoidal deformed laminae and lenses of quartz and feldspars are up to 2.0 mm thick. They are interlayered with chlorite/muscovite/epidote lamina whose thickness does not exceed 0.5 mm. The size of grains of the quartz, feldspars, chlorite and muscovite is very uneven in the examined thin sections. It ranges from 1.5 mm (quartz) to submicroscopic sizes (0.05 mm) of secondary muscovite (sericite) and epidote both replacing microline. Since the schist has experienced intensive shearing, the quartz is strongly recrystallized and strained (Figure 7).

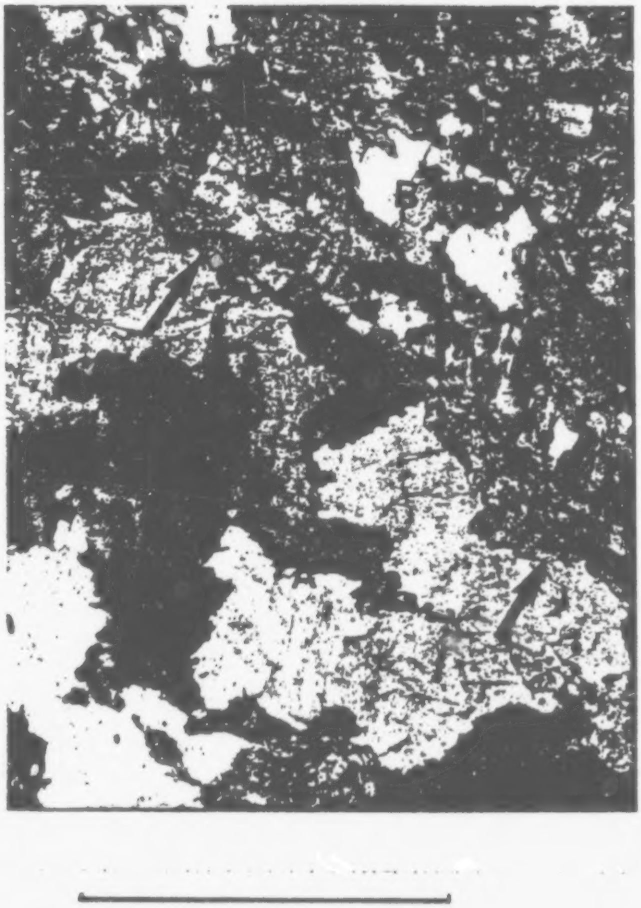

Figure 7
Sample ADI-5

Contact (arrowed) between a lense composed of strained quartz (A) and a phyllosilicate/quartz/feldspars laminae (B).

Optical microscope, crossed nicols
Length of the bar = 1.5 mm

Sample ADI-6

Type of rock: schist

Modal analysis:	55%	- sericite
	40%	- quartz
	3%	- Fe-chlorite
	2%	- pyrrhotite, pyrite, sphene.

Texture: laminated, foliated. Quartz in the rock groundmass occurs as lenticular aggregates up to 0.2 mm long (Figure 8) accumulated in discontinuous laminae that are up to 0.5 mm thick and it is disseminated in and intimately intergrown with sericite and chlorite (Figure 9). The sericite/chlorite laminae prevail in the thin section examined. Their thickness ranges from 0.3 mm to 1.5 mm. The schist was formed under strong tectonic pressure. Therefore, all the quartz present in the sample is recrystallized and strained. The smallest grains of quartz occur in the phyllosilicate-rich laminae, where their size is often below 1 micron.

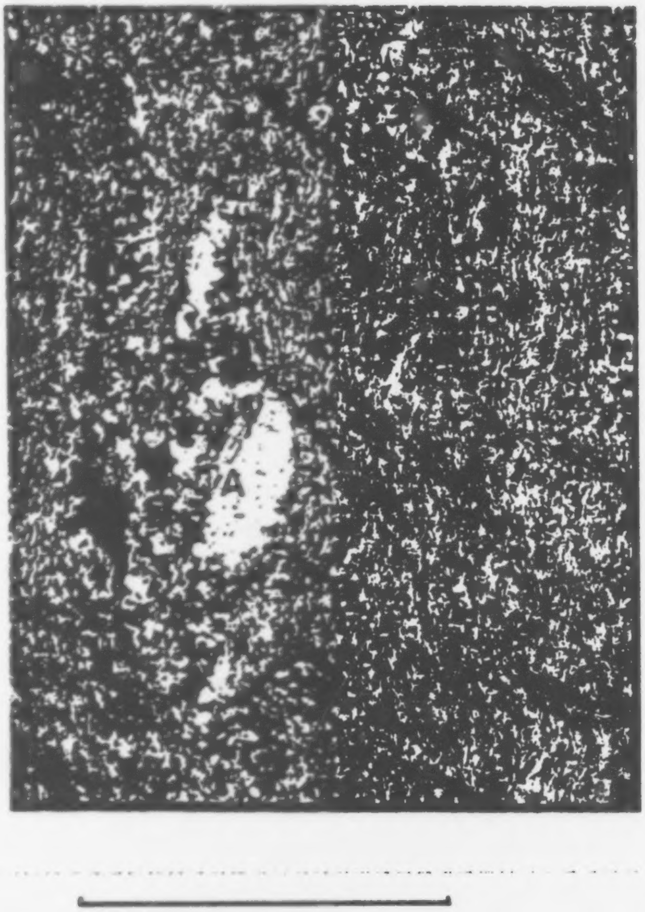

Figure 8
Sample ADI-6

Texture of the schist. Aggregates of quartz marked with (A), sericite/chlorite rich laminae with (B).

Optical microscope, crossed nicols
Length of the bar = 0.4 mm

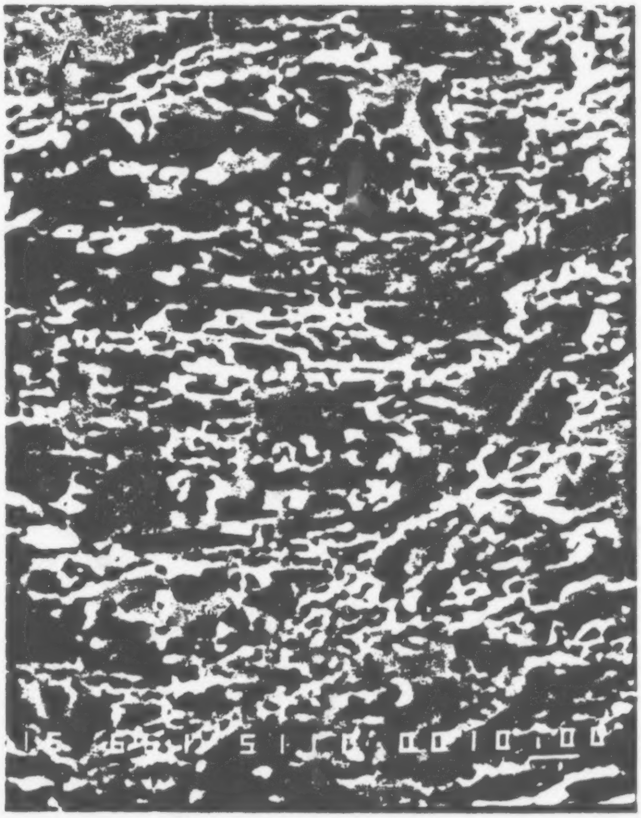

Figure 9
Sample ADI-6

Sericite (A) and Fe-chlorite (light grey to white) intergrown with quartz (B). Black dots are imperfections in polishing.

Backscattered electron image
Length of the bar = 10 micron

Sample ADI-7

Type of rock: meta-greywacke (quartz wacke)

Modal analysis:
50% - quartz
20% - matrix composed of Fe/Mg chlorite
10% - quartzite, microcrystalline silica
10% - feldspars
5% - microcrystalline volcanogenic rocks
3% - muscovite
2% - unidentified rock fragments, magnetite, zircon, pyrite.

Texture: massive, lamination and foliation not visible in the hand sample. Under the microscope, lamination and metamorphic fabric of the rock is quite distinct (Figure 10). It is expressed in flat grains of quartz and the presence of thin, several microns thick, discontinuous laminae of chlorite with iron-(hydroxide?) staining. Size of the mineral and lithic fragments ranges from 0.01 mm to 0.5 mm. Quartz grains appear to be slightly recrystallized on their contacts with the matrix of the meta-greywacke. The chloritic matrix has the composition of the mudstones and siltstones identical to Samples ADI-1 to ADI-4.

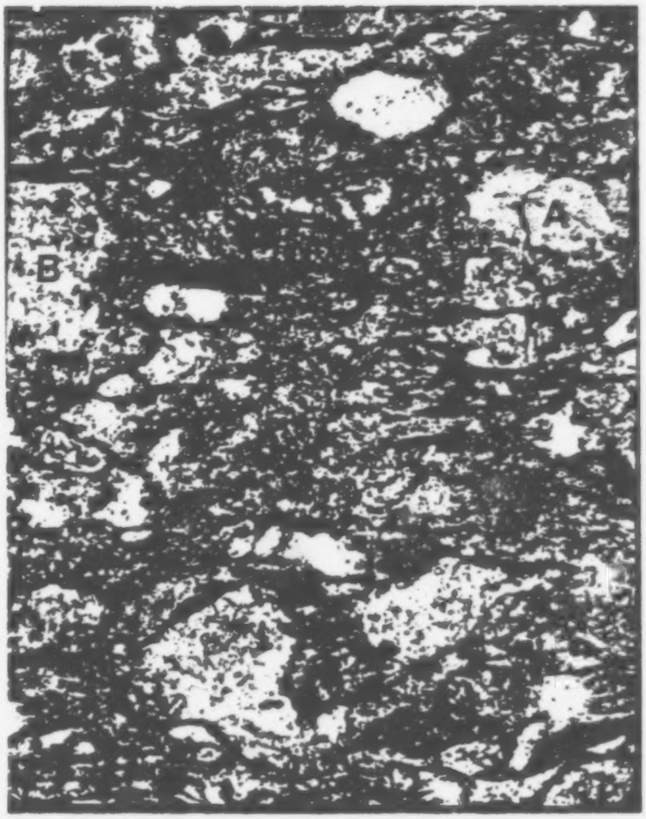

Figure 10
Sample ADI-7

Flattened grains of quartz (such as A) and quartzite (B) in the silty matrix composed predominantly of chlorite (C).

Sample ADI-8

Type of rock: greywacke

Modal analysis:
60% - quartz
15% - unidentified, chloritized fragments of rocks (mudstone?)
10% - Fe/Mg chlorite (matrix)
10% - feldspars (Ca-plagioclase, microcline)
3% - muscovite
2% - microcrystalline quartz/feldspar aggregates (volcanogenic rocks?), zircon, magnetite, pyrite, pyrrhotite.

Texture: massive, non-laminated and non-foliated in the scale of thin section. In contrary to Sample ADI-7, the rock does not seem to be affected by substantial pressure, and no signs of recrystallization were observed. Therefore, the mineral and lithic fragments are not flattened and they have preserved an original angular to subrounded shape (Figure 11). Their size ranges from 0.05 mm to 0.7 mm, but single grains as big as 1.0 mm were also observed. The examined portion of the sample constitutes a gradation into matrix-supported, fine-grained sandstone. The matrix of the greywacke contains grains of microcrystalline quartz whose size ranges from 1.0 micron to 2.0 micron.

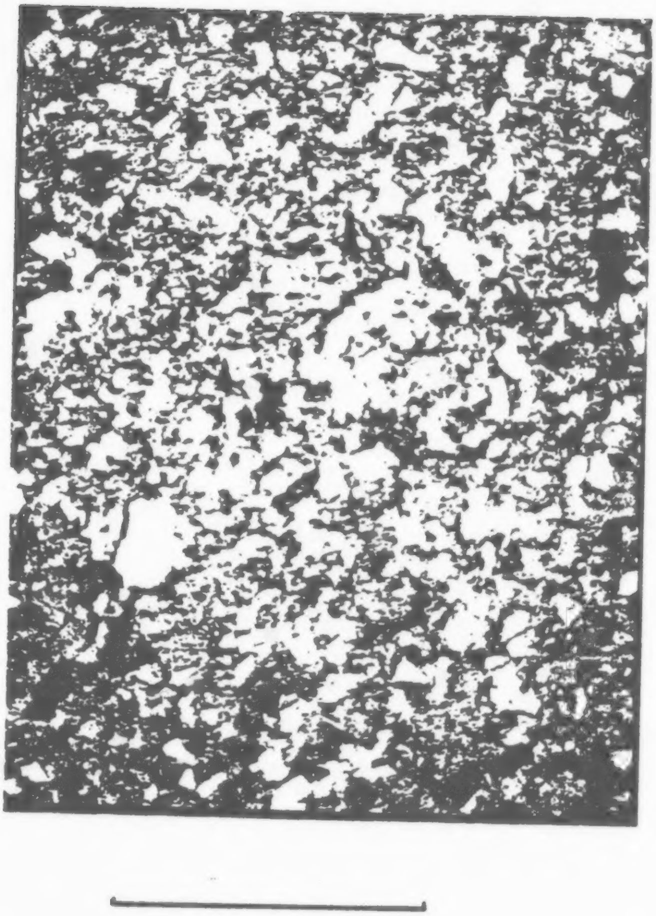

Figure 11
Sample ADI-8

Grain size and texture of the greywacke grading into matrix-supported sandstone.

Optical microscope, crossed nicols
Length of the bar = 1.2 mm

Sample ADI-9

Type of rock: greywacke

Modal analysis:

50%	- Fe-chlorite/sericite matrix
30-40%	- quartz
5-10%	- feldspars (K-feldspars, plagioclases)
5-10%	- lithic fragments, most probably mudstones
3-5%	- muscovite
2%	- zircon, pyrite, magnetite, calcite, fragments of felsic lavas.

Texture: thinly layered, laminated. Particular layers contain either finer or coarser clastic material and the matrix/clasts ratio in the examined under the microscope layers (0.8 cm thick) appears to be very unstable (Figure 12). The finer-grained layers are definitely richer in quartz grains that average 0.08 mm in size than the coarser layers. The latter contain more grains of feldspar and more lithic fragments, whose size averages 0.3 mm.

Comment: The sample constitutes a very good example of the compositional and textural variations characterizing argillites and greywackes from New Brunswick.

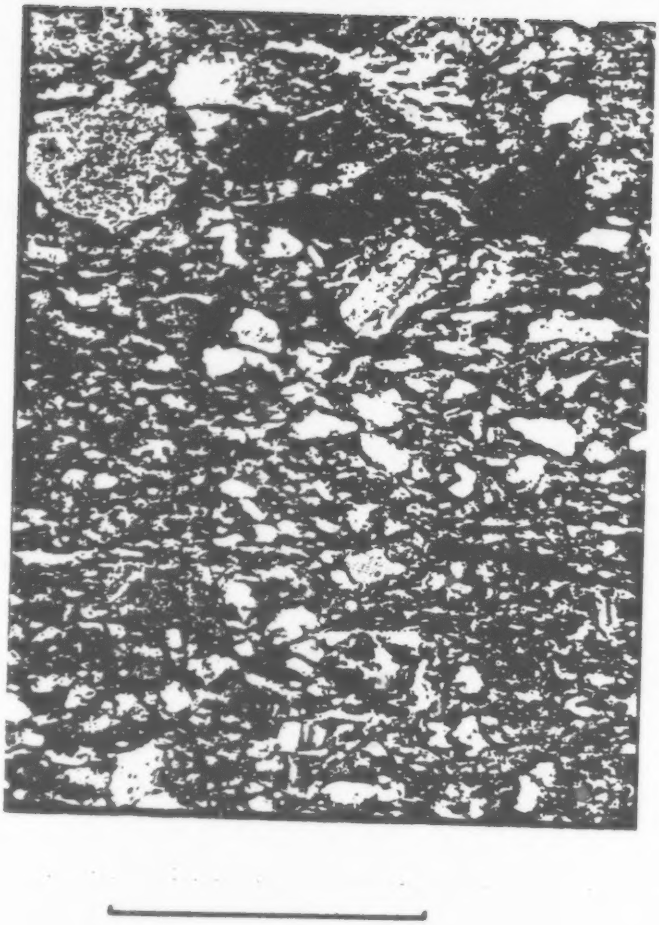

Figure 12
Sample ADI-9

Variations in the grain size of the greywacke.

Optical microscope, crossed nicols
Length of the bar = 0.4 mm

Sample ADI-10

Type of rock: quartzite

Modal analysis:		
	95%	- quartz
	4%	- sericite
	1%	- hematite, zircon, calcite, anherite? (iron carbonate)

Texture: Very fine grained, granular (Figure 13). Strained grains of quartz which are 0.03 mm to 0.1 mm in size form an interlocking mosaic, with minute flakes of sericite occupying interstices between particular grains of quartz. Numerous, thin (up to 0.1 mm thick) shearing zones form an irregular network dissecting the rock. These zones are enriched in sericite, calcite and ankerite. Although the quartz is characterized by an uneven extinction of light under the polarizing microscope, its grains do not show substantial recrystallization, except for the shearing zones.

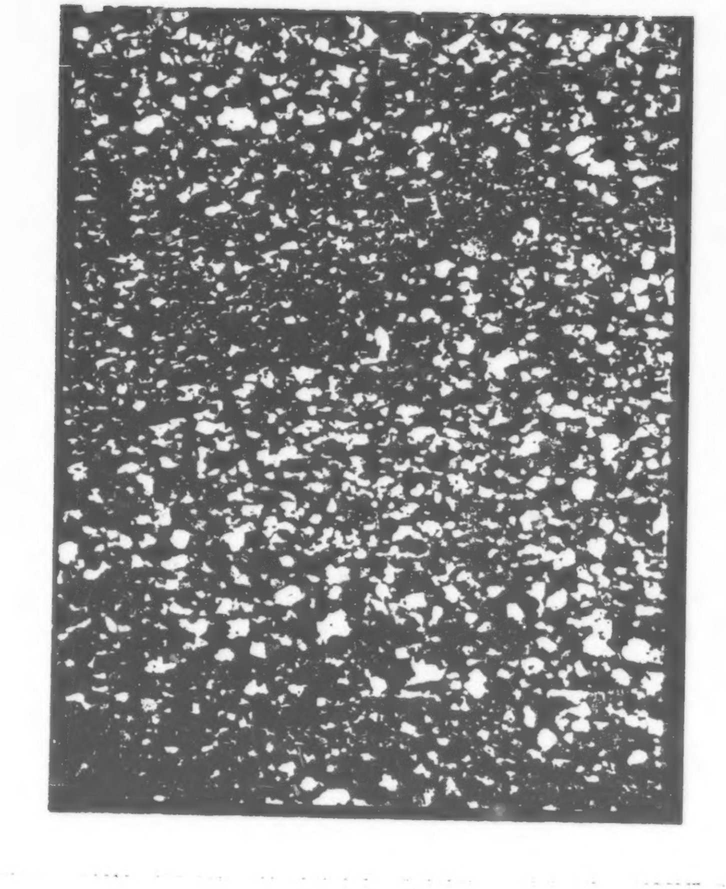

Figure 13
Sample ADI-10

Texture and grain size of the quartzite. Thin shearing zones marked with arrows.

Optical microscope, crossed nicols
Length of the bar = 0.7 mm

Sample ADI-11

Type of rock: quartzite

Modal analysis:	95%	- quartz
	4%	- sericite
	1%	- hematite, chlorite, zircon, pyrite.

Texture: very fine grained, granular. The size of the finest grains ranges from 0.04 to 0.08 mm, while the coarsest grains are up to 0.3 mm across. All the grains of quartz are characterized by undilatory extinction of light under the microscope. Sericite occurs as tiny flakes between the grains of quartz (Figure 14). The size of these flakes ranges between 0.001 mm to 0.04 mm. The remaining minerals occur as submicroscopic inclusions in the quartz.

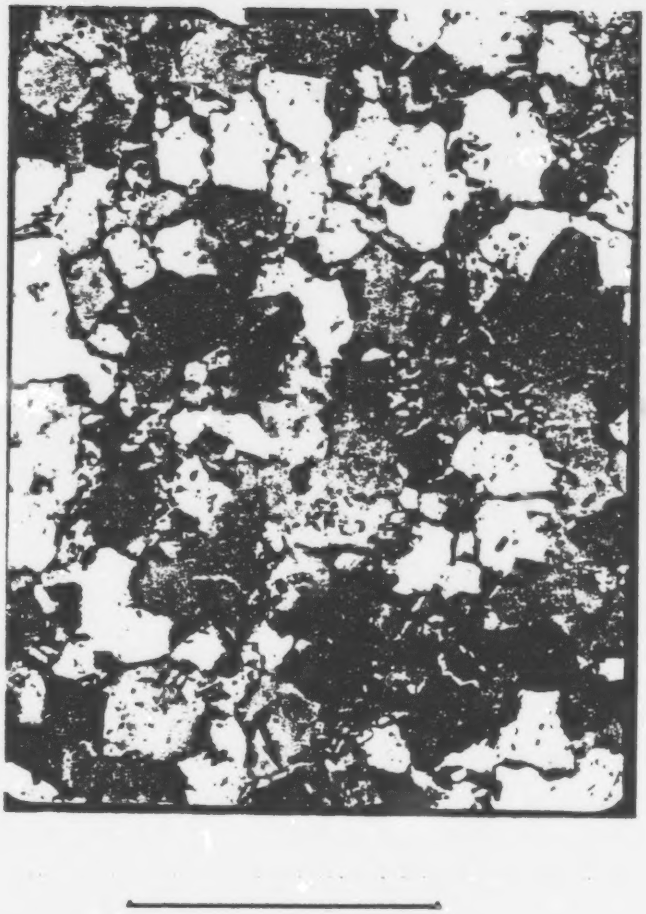

Figure 14
Sample ADI-11

Flakes of sericite (such as arrowed) occupy interstices between quartz grains. Black are imperfections in polishing and opaque minerals (hematite, pyrite).

Optical microscope, crossed nicols
Length of the bar = 0.3 mm

Sample ADI-12

Type of rock: silicified volcanic (rhyolite)

Modal analysis:		
	50%	- microcrystalline quartz
	40%	- microlitic potassic feldspar
	9%	- illite/montmorillonite after feldspars
	1%	- zircon, magnetite

Texture: very fine grained. Quartz occurs in the form of microcrystalline aggregates in which particular grains do not exceed 0.01 mm in size. Microlites of feldspar show up as columnar inclusions in the silicic matrix of the lava or they are agglomerated as irregular, patchy aggregates, replaced by a potassium-rich clay mineral, most probably illite/montmorillonite (Figure 15). Their size does not exceed 300 microns. The quartz/feldspar ratio is very unstable in the examined thin section. Some portions of the sample are composed almost exclusively of feldspar, with only traces of quartz. It is expected that similar compositional inhomogeneity characterizes the whole sample.

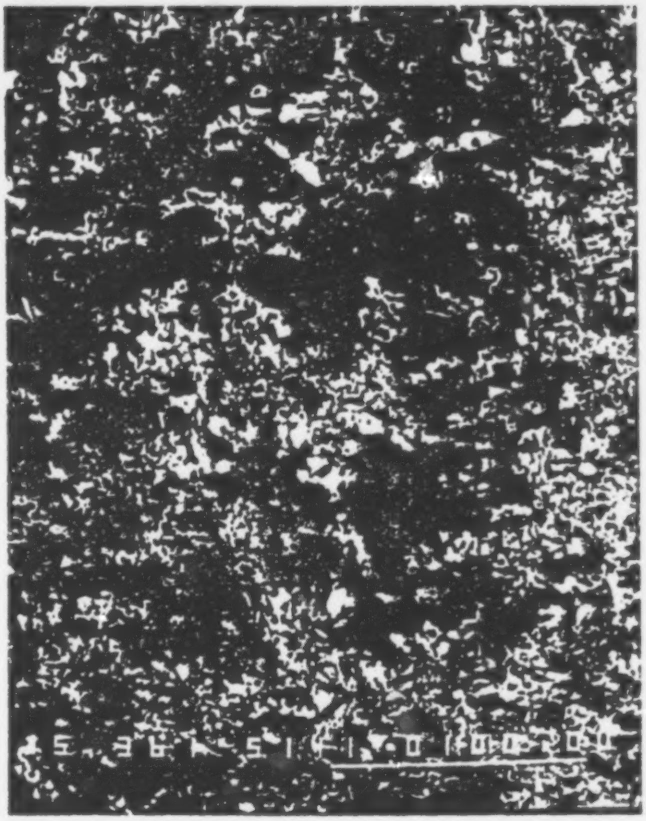

Figure 15
Sample ADI-12

Microcrystalline quartz (grey) intergrown with partly illitized potassic feldspar (light grey).

Backscattered electron image
Length of the bar = 100 microns

Sample ADI-13

Type of rock: microphyric rhyolite

Modal analysis:
70% - microlitic potassic feldspar
28% - quartz
1% - chlorite
1% - zircon, magnetite, calcite, illite/montmorillonite

Texture: very fine grained (microlitic), phyric. The groundmass is composed of a mosaic of microlitic, potassic feldspar and quartz (Figure 16). The quartz/feldspar ratio appears to be stable in the examined thin section. Some of the quartz grains are as small as 1.0 micron and they often occur as inclusions in the feldspar (Figure 17). Phenocrysts of an unidentified plagioclase replaced by chlorite, quartz and calcite are very rare. Their size does not exceed 0.5 mm.

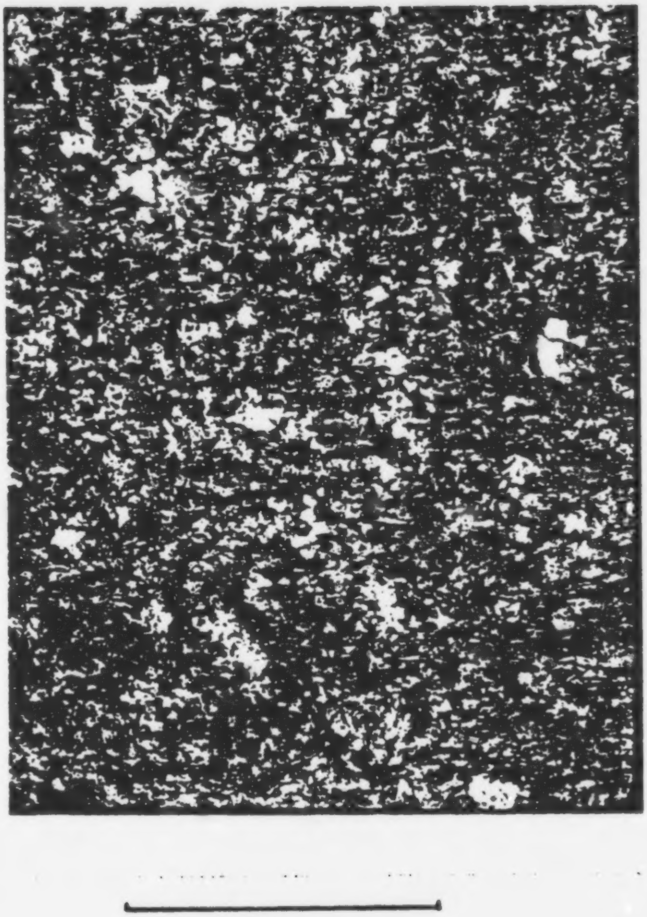

Figure 16
Sample ADI-13

Microlitic feldspar and microcrystalline quartz in the groundmass of the rhyolite.

Optical microscope, crossed nicols
Length of the bar = 0.4 mm

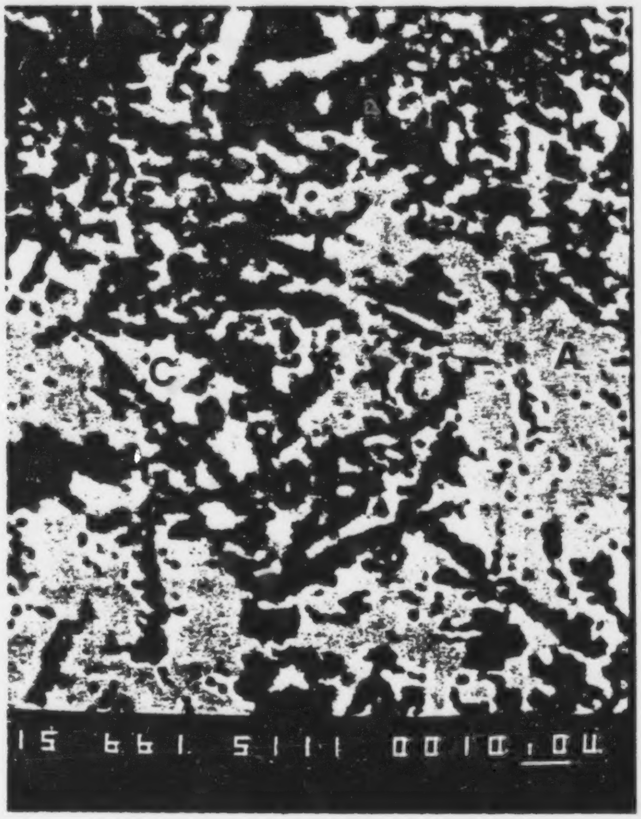

Figure 17
Sample ADI-13

Potassic feldspar (A) intergrown with microcrystalline quartz (B). Iron-rich chlorite is marked with (C). Black are imperfections in polishing.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-14

Type of rock: silicified, phyric, rhyolitic tuff

Modal analysis:
60% - microcrystalline quartz
35% - feldspar
3% - hematite, magnetite
2% - zircon, pyrite, Fe-chlorite

Texture: very fine grained (microlitic), phyric. The size of the phenocrysts of almost completely replaced by illite feldspar ranges from 0.2 mm to 2.0 mm (Figure 18). Microlitic feldspar is almost totally replaced by a K-rich clay mineral, most probably illite. It is intimately intergrown with microcrystalline quartz (Figure 19) whose smallest grains are 1.0 micron across (and probably less than 1.0 micron). The rock has a patchy appearance due to an uneven content of quartz and feldspar. The patches are up to 2-3 mm across.

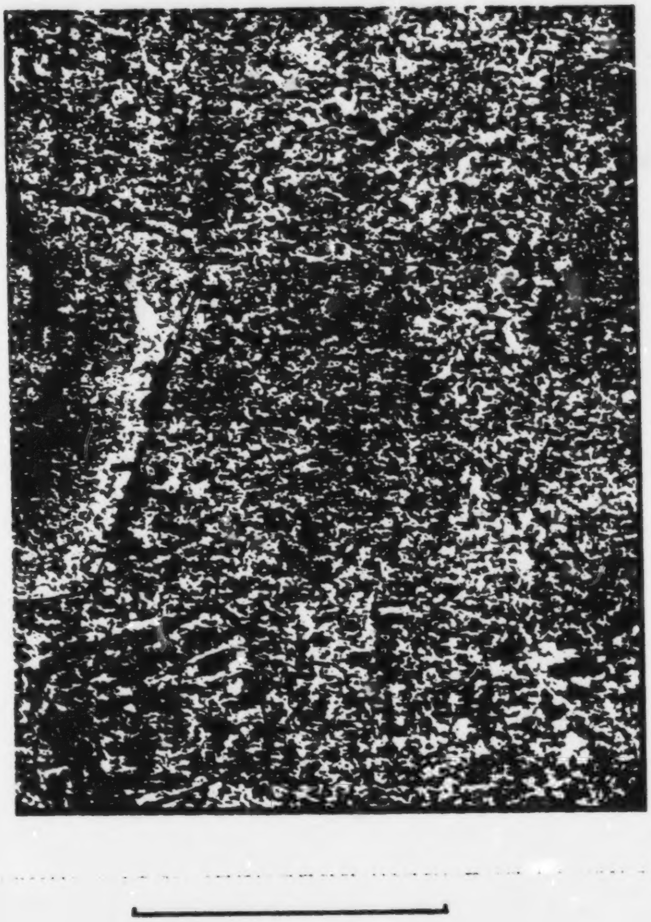

Figure 18
Sample ADI-14

Phenocrysts of illitized feldspar (A) in microlitic matrix of the tuff.

Optical microscope, crossed nicols
Length of the bar = 0.4 mm

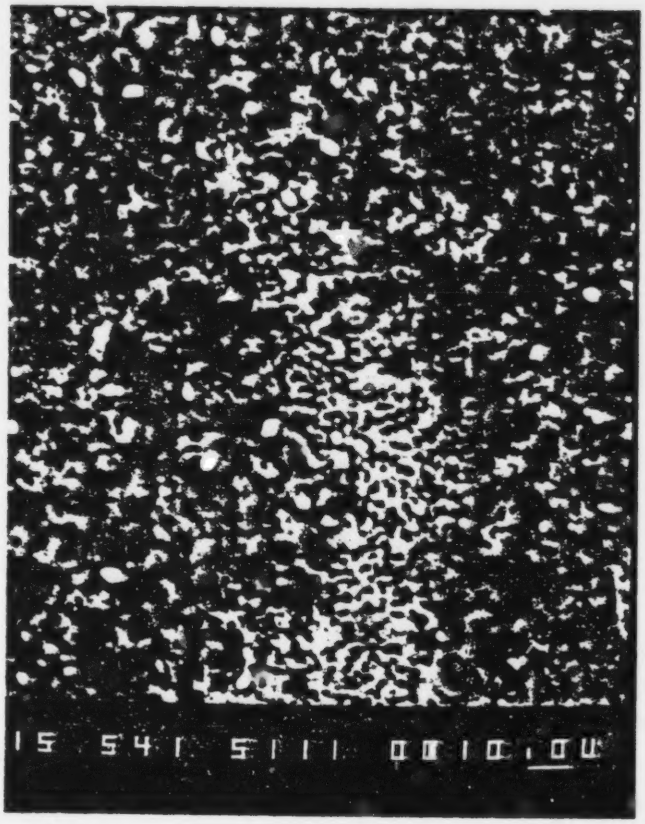

Figure 19
Sample ADI-14

Intergrowths of feldspar (light grey) and quartz (dark grey) in the matrix of the tuff. White dots are hematite, magnetite and zircon. Black dots are imperfections in polishing.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-15

Type of rock: silicic (rhyolitic) lava

Modal analysis:		
	55%	- quartz
	40%	- illitized potassic feldspar
	3%	- Fe-chlorite
	2%	- magnetite, zircon, pyrite

Texture: very fine grained (microlitic). Microcrystalline aggregates of quartz have amoeboidal outlines. They are intergrown with the aggregates of microlitic potassic feldspar having the same appearance like the aggregates of quartz (Figure 20). The size of both the quartz and feldspar aggregates ranges from 1 micron (and less?) to 25 micron across. The feldspar aggregates are partly replaced by tiny flakes of a K-rich clay mineral (illite?). The groundmass of the lava strongly resembles the rhyolites of Samples ADI-12 to ADI-14.

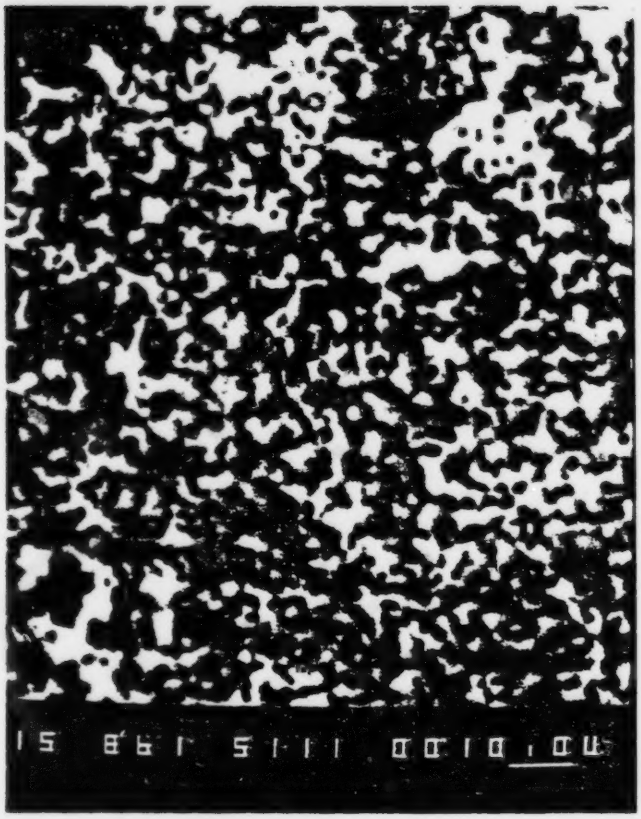

Figure 20
Sample ADI-15

Intergrowths of quartz (dark grey) and feldspar (light grey) in matrix of the silicic lava. Black dots are imperfections in polishing.

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-16

Type of rock: silicic, feldspar lava

Modal analysis:
70% - albite-oligoclase
20% - potassic feldspar
8% - quartz
2% - sphene, Fe-chlorite, pyrite, titanomagnetite rutile

Texture: very fine grained, microlitic. Microcrystalline aggregates of albite/oligoclase are finely intergrown with potassic feldspar. The content of the latter in the examined thin section is very uneven (Figure 21) and one can expect substantial variations in the content of the K-feldspar in the whole sample. Microcrystalline quartz whose aggregates range in size from 1.0 micron (and less?) to 0.02 mm is also intergrown with K-feldspar. They appear to be concentrated in the K-feldspar-rich portions of the sample. The sample differs from the other rhyolites (Samples ADI-12 to ADI-15) with a high content of feldspar which prevails in the examined thin section.

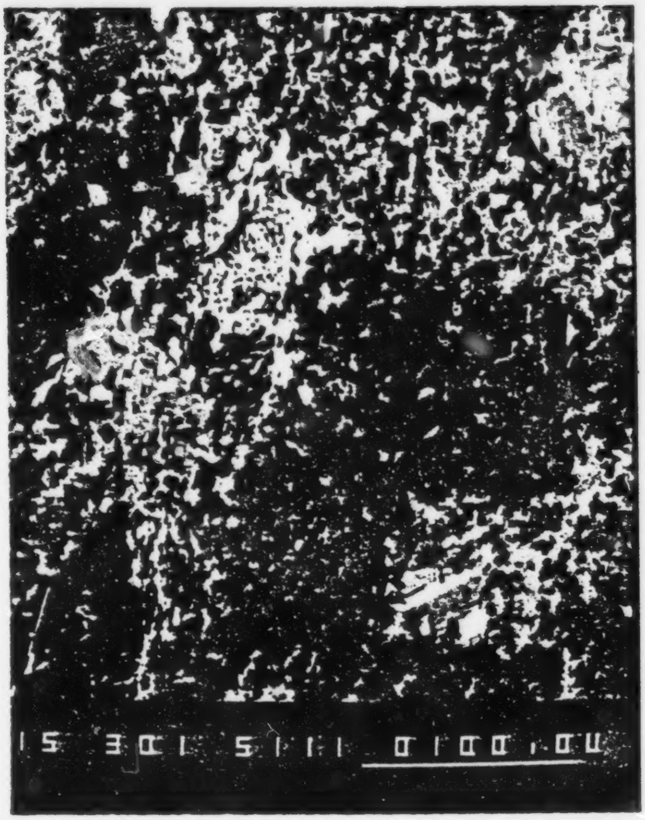

Figure 21
Sample ADI-16

Matrix of the silicic, feldspathic lava. White is sphene, light grey is albite/oligoclase, dark grey is potassic feldspar, black is quartz.

Backscattered electron image
Length of the bar = 100 microns

Sample ADI-17

Type of rock: granite

Modal analysis:
70% - microcline, albite/oligoclase
20% - quartz
8% - biotite and chlorite after biotite, chlorite after amphibole
2% - titanomagnetite, rutile, sphene, apatite

Texture: Coarse grained, granular equigranular. The average size of the major and accessory rock forming mineral grains is 1.5 mm in the examined thin section. All the feldspars are affected by alteration. The alteration products are very fine scales of sericite and a potassium-rich clay mineral, most probably illite. Flakes of chlorite replace infrequent grains of biotite and amphibole. Several grains of titanomagnetite are pseudomorphed by sphene and leucoxene.

Most of the quartz is strained (Figure 22). The strained portions of its accumulations are very fine, composed of interlocking mosaic of elongated in one direction grains. The strained and recrystallized quartz results from shearing that affected the sampled portion of the intrusion.

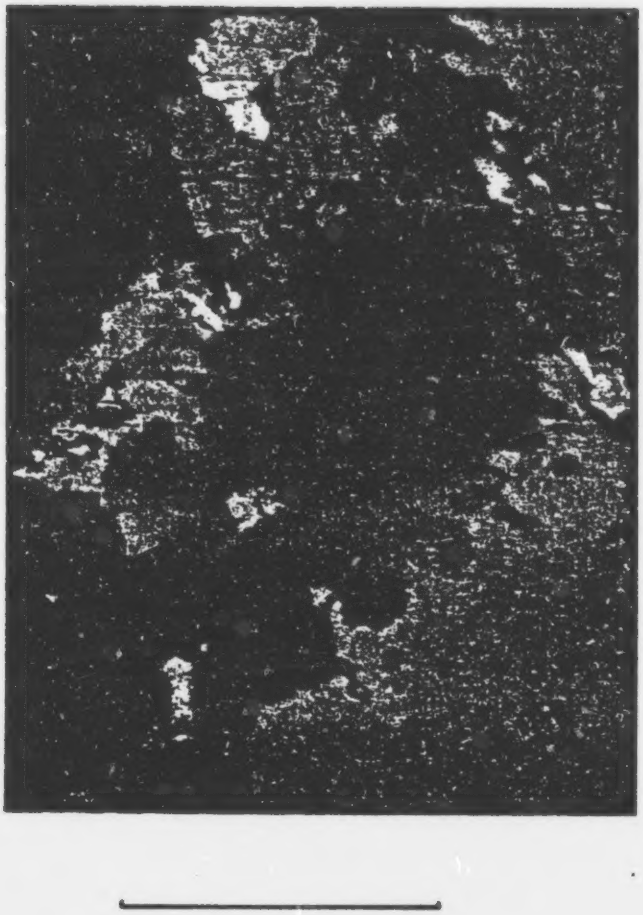

Figure 22
Sample ADI-17

Strained quartz in the granite.

Optical microscope, crossed nicols
Length of the bar = 0.3 mm

Sample ADI-18

Type of rock: granite

Modal analysis: 65% - orthoclase, microcline both sericitized
15% - Na/Ca plagioclase
15% - quartz
3% - chloritized biotite
2% - chloritized amphibole, zircon, magnetite, rutile, sphene, calcite

Texture: Coarse grained, granular equigranular. An average grain size of the major rock-forming minerals is 3.5 mm (Figure 23). Most of the feldspars are replaced by submicroscopic in size scales of sericite and trace amounts of calcite. Quartz is slightly strained. Some of its grains are recrystallized on to a very fine, mosaic of randomly (optically) oriented aggregates. The mafic minerals (biotite and amphibole) are almost completely replaced by a rich in iron chlorite and trace magnetite.

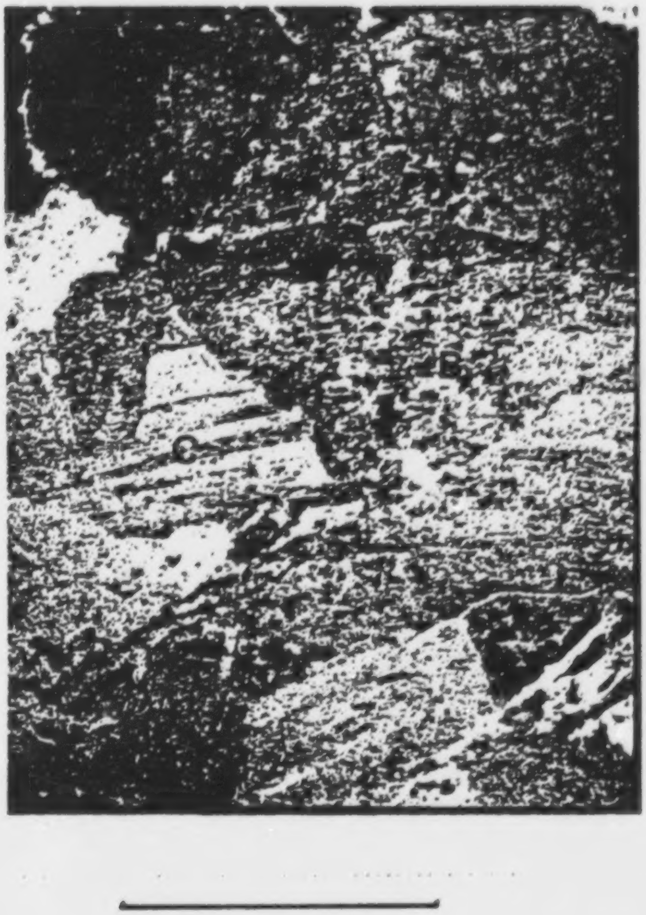

Figure 23
Sample ADI-18

Coarse grained quartz (A) and strongly sericitized orthoclase (B) and albite-oligoclase (C) in the granite groundmass.

Optical microscope, crossed nicols
Length of the bar = 1.5 mm

Sample ADI-19

Type of rock: quartz monzonite

Modal analysis:
50% - orthoclase, perthite
30% - Na/Ca plagioclase
10% - quartz
6% - biotite
2% - muscovite
2% - zircon, apatite, sericite after feldspars, chlorite after biotite (and amphibole?)

Texture: Coarse grained, granular, nonequigranular. The average size of the grains of feldspars is 2.0 mm, while quartz forms granular aggregates in which particular grains are 0.05 mm to 0.8 mm in size. All the feldspars are crowded with submicroscopic scales of sericite. Flakes of biotite average 0.5 mm in size. They are slightly replaced by chlorite. Quartz does not display any significant straining (Figure 24).

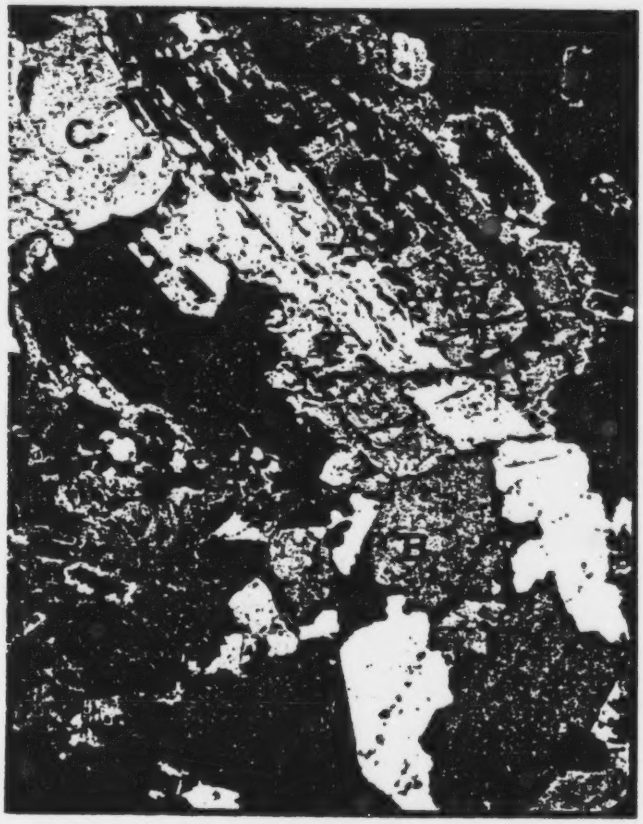

Figure 24
Sample ADI-19

Na/Ca plagioclase partly replaced by chlorite (black streaks and patches), quartz (B) and orthoclase (C) in groundmass of the monzonite.

Optical microscope, crossed nicols
Length of the bar = 1.0 mm

Sample ADI-20

Type of rock: quartz gabbro

Modal analysis:		
	52%	- plagioclase (andesine-labradorite)
	35%	- pyroxenes partly replaced by uralite
	8%	- biotite
	2%	- hornblende
	2%	- quartz
	1%	- chlorite, ilmenite, rutile, apatite, sphene, pyrite, chalcopyrite.

Texture: coarse grained, granular, equigranular, interlocking. Subhedral grains of all the mineral constituents have approximately the same size that averages 1.5 mm (Figure 25). The presence of quartz and appreciable amounts of biotite in the groundmass indicate a "granite" affinity of the rock, which compositionally approaches diopite. The rock is affected by shearing associated with chloritization of the mafic minerals in the groundmass adjacent to the shearing planes.

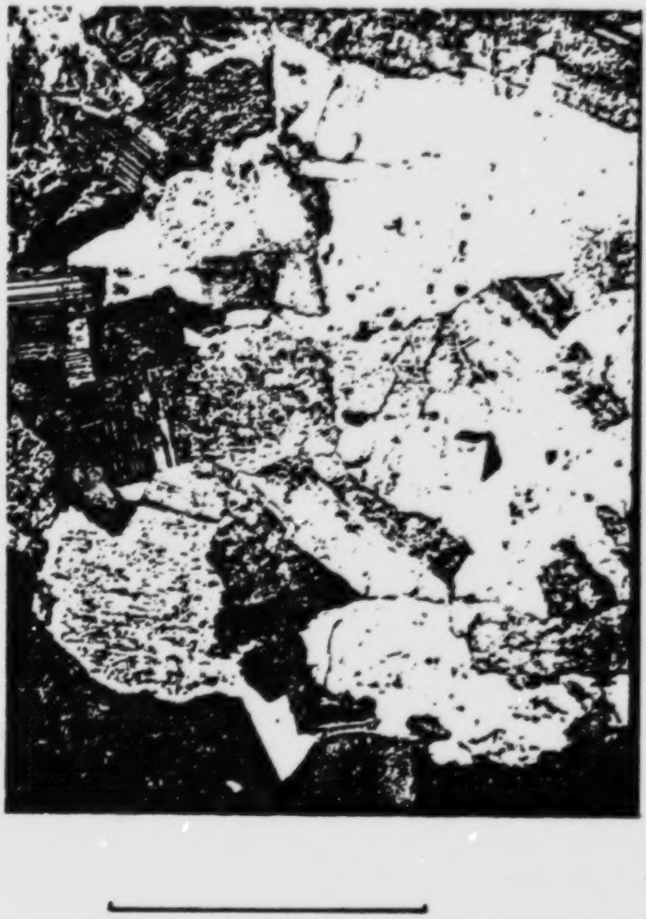

Figure 25
Sample ADI-20

Grain size and texture of the gabbro.

Optical microscope, crossed nicols
Length of the bar = 1.0 mm

Sample ADI-21

Type of rock: phyric, chloritized basalt

Modal analysis:
50% - albitized plagioclase
40% - Fe-chlorite
5% - sphene, leucoxene
3% - calcite
2% - pyrite, quartz, rutile

Texture: fine grained and sub-trachytic (laths of plagioclases in the groundmass are oriented in approximately one direction), phyric. Phenocryst of an albitized and calcitized plagioclase constitute about 5% of the rock groundmass. Their size ranges from 0.5 cm to 3.0 mm. The size of lathy plagioclases (Figure 26) of the rock's matrix averages 0.2 mm. The original rock-forming minerals are totally replaced by secondary phases (albite, chlorite). The chlorite is rich in iron. Quartz is also of a secondary origin as indicated by its association with pyrite and calcite.

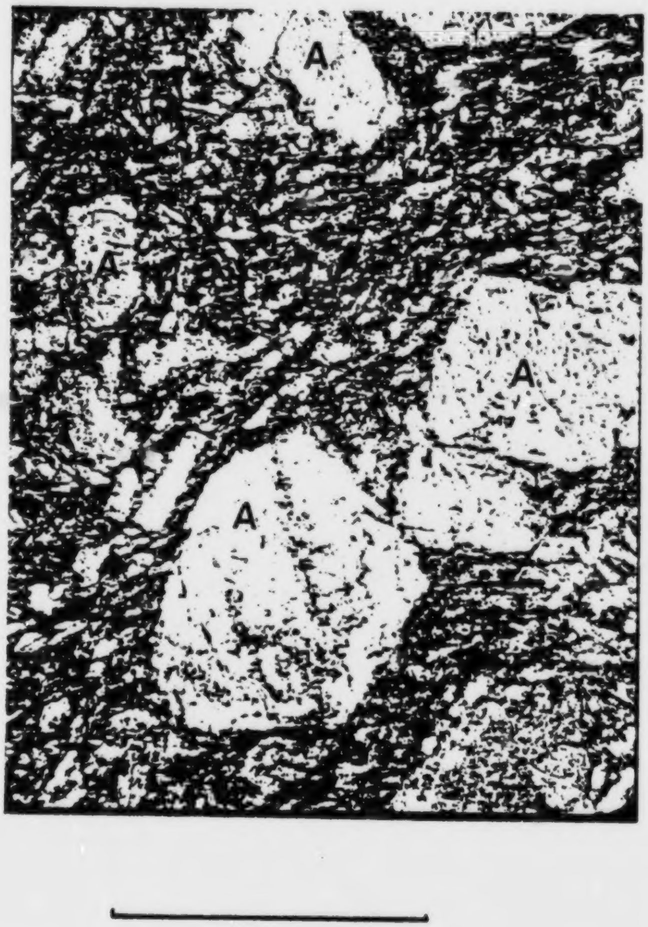

Figure 26
Sample ADI-21

Phenocrysts of plagioclase (A) set in groundmass containing laths of plagioclase (white) and chlorite (grey).

Optical microscope
Length of the bar = 0.5 mm

Sample ADI-22

Type of rock: limestone

Modal analysis:	99%	- calcite
	1%	- Mg/Fe chlorite, quartz, pyrite

Texture: very fine grained, granular. The size of particular grains of calcite ranges from 0.01 mm to 0.4 mm, averaging 0.05 mm in the examined thin section. The rock is composed of pure calcite. Electron microprobe analysis did not reveal the presence of mangnesium in the composition of the calcite. Chlorite occupies interstitial spaces between particular grains of calcite while the grains of quartz, whose grains approach the size of the calcite, are intergrown with the latter.

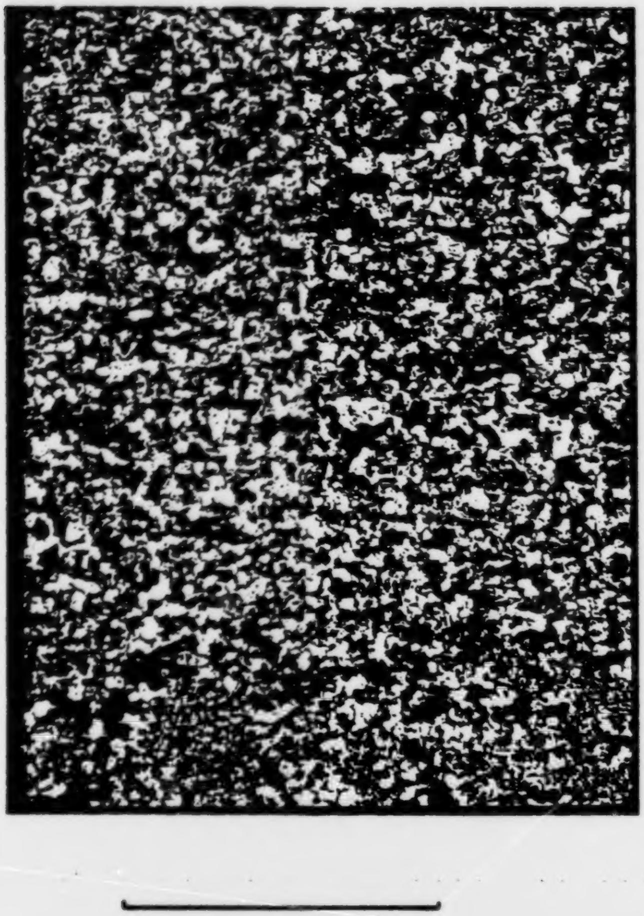

Figure 27
Sample ADI-22

Texture of the limestone.

Optical microscope, crossed nicols
Length of the bar = 1.0 mm

Sample ADI-23

Type of rock: dolomite

Modal analysis:	99%	- dolomite
	1%	- sericite, chlorite, pyrite, pyrrhotite

Texture: very fine grained, granular. Grains of dolomite form an interlocking mosaic. The size of particular grains ranges from 0.005 mm to 0.03 mm in the examined thin section. The content of the dolomitic component (pure $MgCO_3$) varies substantially from grain to grain (Figure 28). Sericite and chlorite occupy interstitial position between dolomite grains, while the sulphides form inclusions in the carbonates.

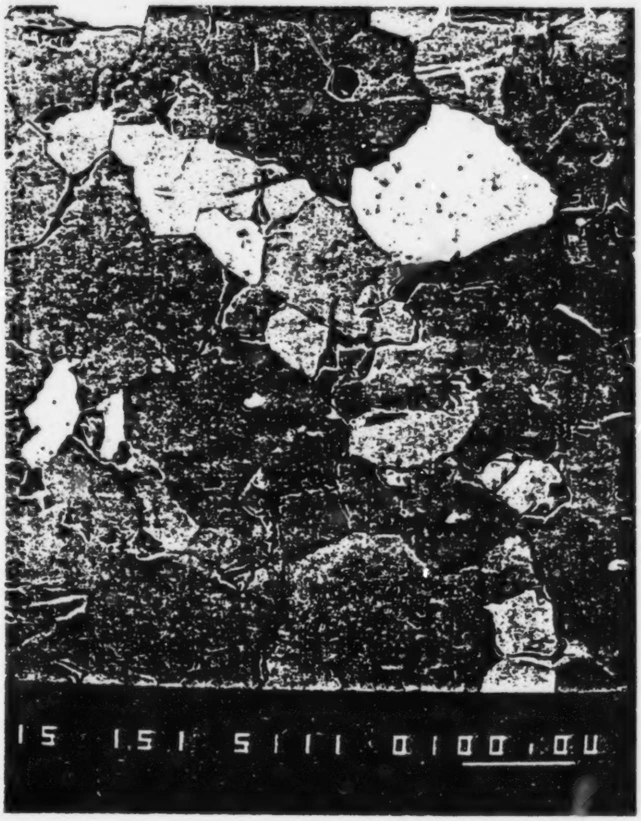

Figure 28
Sample ADI-23

Compositional variations in the dolomite. The brighter grains contain more calcium and less magnesium than darker grains, which are rich in magnesium with only trace amounts of calcium.

Backscattered electron image
Length of the bar = 100 microns

Sample ADI-24

Type of rock: limestone

Modal analysis:
95% - calcite
3% - quartz (overall), in places up to 20%
2% - sericite
1% - pyrite, amorphous iron hydroxides, rutile, sphene

Texture: Very fine grained, thinly laminated. Lamination of the limestone reflects uneven content of sericite and quartz in the groundmass. In places, the content of quartz and sericite is high enough to identify this rock as silty limestone. Foliation is well developed, emphasized by the presence of amorphous iron hydroxides on the slaty cleavage planes (Figure 29). The size of the rock-forming calcite grains ranges from 1.0 micron to 50.0 microns. Quartz and sericite grains are up to 30 microns in size. The smallest grains of quartz are 1.0 micron or less (microprobe resolution = 1 micron). An average size of the grains of pyrite reaches 50 microns. Electron microprobe investigation of the rock revealed that some of the calcite grains contain substantial magnesium and may be identified as dolomite (Figure 30).

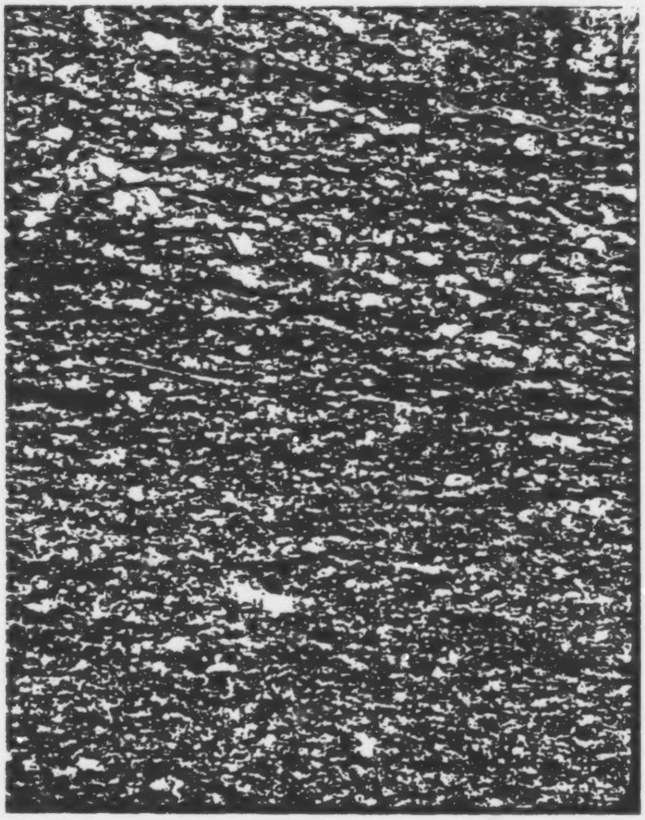

Figure 29
Sample ADI-24

Slaty cleavage (arrowed) and texture of the limestone.

Optical microscope, crossed nicols
Length of the bar = 0.3 mm

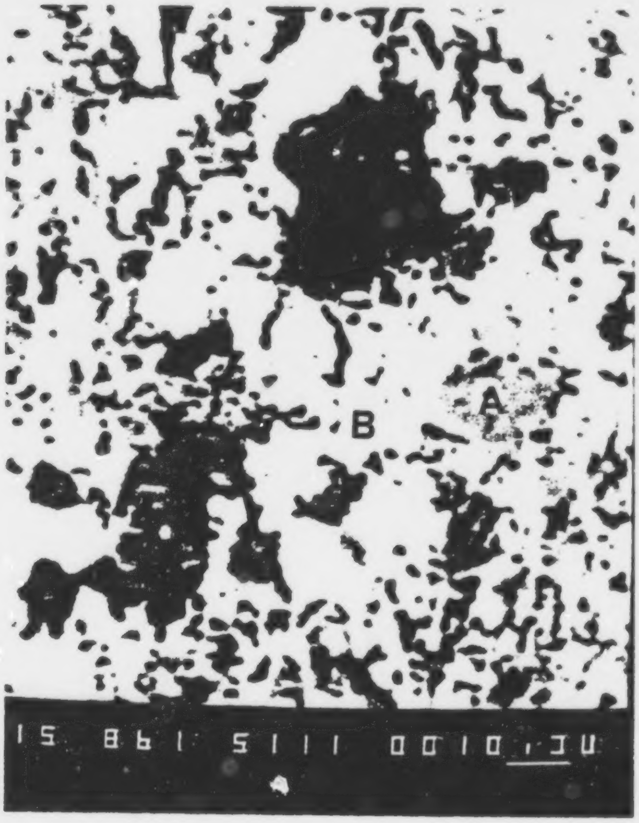

Figure 30
Sample ADI-24

Dolomite (light grey, such as A) and calcite (B), in a silty layer containing quartz (such as B, dark grey).

Backscattered electron image
Length of the bar = 10 microns

Sample ADI-25

Type of rock: limestone

Modal analysis: 95% - calcite
4% - sericite
1% - quartz, pyrite, hematite/magnetite

Texture: thinly laminated, granular, nonequigranular. The size of the elongated grains according to the foliation grains of calcite ranges from 0.01 mm to 2.0 mm (Figure 31). The lamination of the rock results from an uneven distribution of the grains of various sizes and concentration of sericite plus iron oxides in certain thin (up to 0.05 mm thick) horizons parallel to the foliation of the limestone. Electron microprobe investigation did not reveal dolomite in the composition of this limestone and only traces of quartz grains that range in size from 1.0 micron to 20.0 microns were detected.

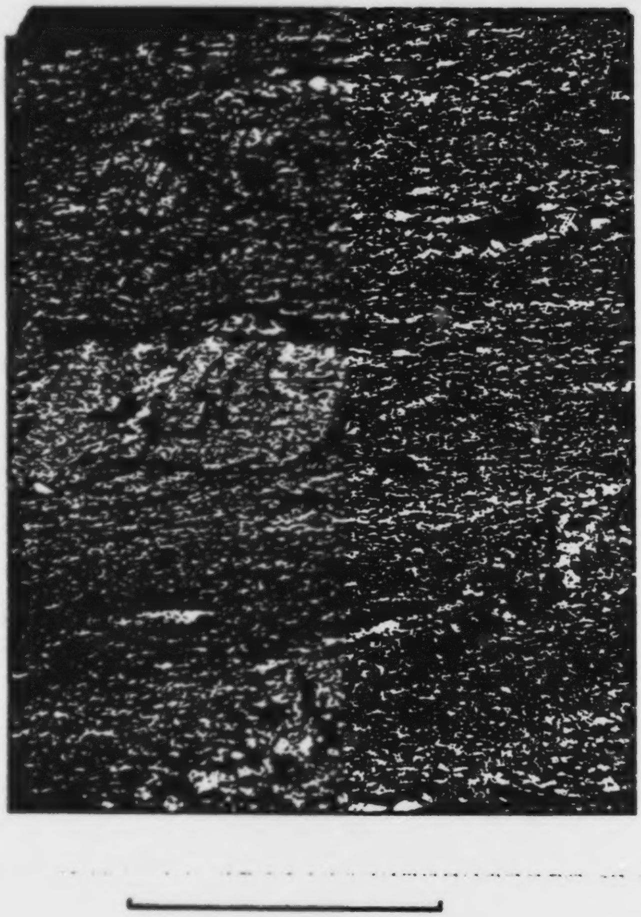

Figure 31
Sample ADI-25

Variations in grain size of the limestone. Big, polycrystalline grains of calcite (A) are set in a very fine grained, calcitic matrix (B).

Optical microscope, crossed nicols
Length of the bar = 1.5 mm

4.0 CONCLUSIONS

Based on the results of the examination of 32 potential aggregate sources from New Brunswick performed for ADI Ltd. by RPC in 1986 and analysis of the bedrock geology of the province, the following conclusions have been drawn:

(i) The samples of 25 rocks described in this report represent the most widespread types of bedrocks of the New Brunswick area.

(ii) The reported 25 types of rocks are the most common constituents of the aggregate sources from New Brunswick.

(iii) All the 25 types of rocks examined are characterized by a substantial compositional and textural inhomogeneity, which may be observed often in the scale of a hand sample and/or under the microscope.

AUTHORIZATION

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STUDY OF
THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES
OF
NEW BRUNSWICK

APPENDIX G

EQUIPMENT AND TEST METHODS
MIX DESIGN DATA FOR TEST SPECIMENS
MORTAR BAR AND CONCRETE PRISM TESTS

CONTRACT SERIAL NUMBER OSQ85-00187

CONTRACTOR: ADI LIMITED

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APPENDIX G

File: 1264-30
Date: November, 1989

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STUDY OF THE ALKALI REACTIVITY
OF POTENTIAL CONCRETE AGGREGATES
OF NEW BRUNSWICK

APPENDIX G

EQUIPMENT AND TEST METHODS
MIX DESIGN DATA FOR TEST SPECIMENS
MORTAR BAR AND CONCRETE PRISM TESTS

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APPENDIX G

AGGREGATE TESTING PROGRAM

Equipment and Test Methods

1.1 Equipment

The equipment used for this research program was made to the applicable specification requirements of CSA A23.2 and ASTM C227.

1.1.1 Moulds

All moulds met the dimensional requirements of CSA A23.2-14A or ASTM C277.

The mortar bar moulds were made of two materials; cold rolled steel and brass. The steel moulds were of a size such that two specimens could be cast while the brass moulds were large enough for casting of three specimens; however, only two were cast at once during this test program.

The concrete prism moulds were fabricated of steel and were of a size to produce one prism.

1.1.2 Tamping Rods

Tamping rods were used to tamp the mortar and concrete in the appropriate moulds. These tampers met the dimensional requirements of CSA A23.2-14A and ASTM C227.

1.1.3 Length Comparator

Two length comparators were fabricated; one for the mortar bars and one for the concrete prisms. The comparators were fitted with Mitutoyo Digimatic Indicators, accurate to within 0.001 mm and with a travel of 30 mm. The prism comparator was fabricated as shown in CSA A23.2-M77 supplement 2 - 1986. The mortar bar comparitor mounts the bars vertically, similar to that shown in ASTM C490.

The standard reference bars were made of 12.5 mm diameter invar steel covered with 5 mm thick rubber hose over approximately 90 percent of the bar's length.

1.1.4 Mixers

The mortar mixer was a Hobart Model N50 with a 5.7 L capacity. A few minor clearance adjustments were made to meet the ASTM C227 specification requirements.

The concrete mixer was a tilting mixer, manufactured by CIL of Fredonia, Wisconsin. The rated capacity of the mixer is 0.08 cubic meters and the mixer was set up so that the concrete could be deposited directly into a wheelbarrow from which the specimens were cast and the rest of the testing carried out.

1.1.5 Ovens

Three ovens were used for the aggregate preparation portion of the program and for storage of accelerated mortar bar test specimens. They were manufactured by Quincy Lab Inc. Model 21-350-3, each with a capacity of 0.23 m^3 and thermostatic control capable of operating between ambient and 175°C temperatures.

1.1.6 Scales

Three scales were used in the program with each calibrated prior to use. The scales were as follows:

1. Mettler P 1200 electronic balance with a capacity of 1200 g, sensitivity of 0.01 g and tare adjustment over the entire range.
2. Mettler PE16 electronic balance with a capacity of 16000 g, sensitivity of 0.1 g and tare adjustment over the entire range.
3. Homs platform balance with a capacity of 150 kg, sensitivity of 50 g and tare adjustment.

1.1.7 Specimen Containers

Concrete prism containers were made of polyethylene, purchased from the United States Plastics Corporation of Lima, Ohio. The inside dimensions were 457 mm x 305 mm x 305 mm with 6.3 mm wall. The prisms were supported on 100 mm PVC pipe split in half. Absorbent cloth material was supported by means of a brass wire cage around the sides and top of the specimens so that the wick did not come in contact with the specimens. The tops of the boxes were made of flat pieces of PVC sheet approximately 6 mm thick. The tops were sealed on the boxes by placing weatherstripping around the outside contact area, then taping the joint with 50 mm wide vinyl tape and then securing them with 8 small C clamps.

Mortar bar containers were fabricated locally and made from 300 mm diameter PVC pipe approximately 460 mm long. A brass wire support rack was used to hold up to six specimens.

Blotting paper was used around the outside wall, in the central ring, and over the top. The plastic covers were purchased from the United States Plastics Corporation. They were sealed by covering the joint with 50 mm wide vinyl tape. Specimen containers met the dimensional requirements of ASTM C227.

Accelerated mortar bar containers were Rubbermaid microwave and dishwasher proof containers approximately 25 x 36 x 12 cm.

1.1.8 Moist Curing Room

A moist curing room at 100 percent humidity and a temperature of 23±2°C was used for concrete prism storage. The size of the room was approximately 1.8 m x 3.8 m long x 2.4 m high with specimen storage shelves along each side.

The temperature and 100 percent humidity of the room was maintained by a 275 L hot water heater and continuous fog spray. A 7 day temperature chart recorder Model UE650 manufactured by the United Electric Controls Co. of Watertown, Mass., was fitted to the room to record the temperature for the entire test period.

1.1.9 High Temperature Facilities

A dry high temperature room maintained at a temperature of 38±2°C was used for storing the sealed mortar bar and concrete prism containers. The size of the room was approximately 3 m wide x 3.8 m long x 2.4 m high with specimen containers storage shelves on each side and along two thirds of the middle area.

The temperature of the room was maintained by electric baseboard heaters together with four circulating fans in order to ensure a constant temperature throughout the entire room.

The thermostatic control was a temperatue controller with a seven day chart recorder Model UE650 manufactured by the United Electric Controls Co. of Watertown, Mass.

The high temperature room was calibrated by placing thermometers at third points of each storage rack. The heat and air circulating fans were then adjusted to ensure a uniform temperature throughout the room of 38±2°C.

The specimen containers were stored in the room and thermometers placed inside the containers at the third points of each storage rack.

It was found that the thermostatic control had to be set at 40.5°C in order to maintain the temperature inside the storage containers at 38±2°C.

An oven was used to provide a dry 80°C temperature controlled chamber for storage of accelerated mortar bar specimens.

1.1.10 Plastic Concrete Test Equipment

Slump Cone, Tamping Rod, Roll-A-Meter, Thermometers and 15 L density measure were utilized; each measured and calibrated to meet CSA A23.2 specification requirements. Air contents of mortar were checked with an M&L - 2755 pocket size concrete air indicator.

The motorized flow table and associated mold and tamper used to determine the flow of the mortar, met the requirements of ASTM C227.

1.1.11 Laboratory Crusher

The laboratory jaw crusher was made by Pacall Engineering Co. Ltd. of Crawley Sussex, England. The jaw was capable of handling particles up to 150 mm.

1.1.12 Particle Separation Equipment

Four sieve shakers were used to separate and grade the fine and coarse aggregate for the test program.

The sizes and types were as follows:

1. Mary Ann sieve sifter manufactured by Rainhart Manufacturing Co. Ltd. of Austin, Texas, capable of handling 200 mm diameter standard size screens.

2. Ro Tap sieve shaker manufactured by W. S. Tyler Inc. capable of handling up to 200 mm diameter standard size screens.

3. Endicots sieve shaker manufactured by Endicots Filters Ltd. of London, England, capable of handling up to 200 mm diameter standard size screens.

4. Gilson TS2 sieve shaker manufactured by Gilson Company Inc. of Worthington, Ohio, capable of separating the coarse aggregate needed for the prism test.

1.2 Mix Design and Casting Prisms

Mix designs and prism casting procedures were in accordance with CSA A23.1-M77-14A (1986 rev.)

1.2.1 Mix Design

All concrete prisms were cast from the following basic mix design:

Cement - 310 kg/m^3 as specified by CSA A23.1-14A.

Coarse Aggregate was set at 60 percent of the total aggregate which was the maximum practical amount for workability with the crushed aggregates.

Water - adjusted to obtain a slump of 80±10 mm.

NaOH - as required to increase the alkali content of the cement to 1.25 percent.

The mix designs were calculated based on saturated surface dry (SSD) aggregates using the actual fineness modulus and relative density of the materials. Table G1 shows typical work sheets used for the mix designs. The air content was taken as an average of 1.5 percent. The actual proportions used, together with water/cement ratios, compressive strength results, etc., are given in following sections of this Appendix (G).

1.2.2 Batching

Sand for the concrete prisms was weighed in a dry condition on a digital balance sensitive to 0.1 g.

Coarse aggregate for the concrete prisms was weighed in a dry condition in three size fractions of equal weight on a digital balance accurate to 0.1 g. The sand and stone for the concrete prisms were soaked for 24 h prior to mixing and then drained and reweighed before batching to determine the amount of free water.

TABLE G1- TYPICAL WORK SHEETS FOR MIX DESIGN

File: 1264-30

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R3 - 1 & 2
DATE: 87 03 31
TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) 0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.003941	310
Water	180	7.200	—	—	—	7.228	0.00723	181
Sand	746	29.840	29.692	33.382	3.690	29.840	0.01131	746
C.A. 20-14 mm	388.333	15.533	15.466					
14-10 mm	388.333	15.533	15.466	47.605	1.006	46.599	0.01696	1165
10- 5 mm	388.333	15.533	15.466					
Air	1.5	1.5	—	—	—	1.6%	0.00064	1.6%
Totals	2401	96.039	—	—	4.696	96.067	0.04001	2402

Slump, mm - 90
Air Content, % - 1.6
Unit Weight, kg/m^3 - 2430
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.583
Comp. Str. @ 28 d, MPa - 30.2, 31.8

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.747
Absorption, %	-	0.50	0.43
Fineness Modulus	-	2.540	—
Total Water Used (excess water in aggregates plus extra required)	-	7.228	
Extra alkali used (NaOH)	-	—	

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST
R3

Material	Quantities Per Cubic Metre (SSD Aggregates) Mass, kg	Quantities Per Cubic Metre (SSD Aggregates) Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	746	0.283
20 - 5 mm	1165	0.424
Air	1.5%	0.015
TOTALS	2401	1.000
Sand, %	40	
Paste, m^3	0.293	
Sand	0.707 x 2.638 x 0.4 x 1000	
20 - 5 mm	0.707 x 2.747 x 0.6 x 1000	

	Sand	20 - 5 mm
Relative Density -		
Fineness Modulus -		---

Cement for the concrete prisms was weighed on a digital balance accurate to 0.1 g.

Mixing water for the concrete prisms was weighed on a digital balance accurate to 0.1 g.

Sodium hydroxide for the concrete prisms was weighed on a digital balance accurate to 0.1 g.

The sodium hydroxide was dissolved in a small amount of the mix water and added to the mix before adding the final amount of mix water, needed to bring the mix to the required consistency.

1.2.3 Mixing

The size of the batches produced in the tilting concrete mixer was 0.04 m^3. The procedure used was as follows:

1) Just prior to mixing the test batch, the mixer was buttered by mixing a batch proportioned closely to the test batch. The mortar adhering to the mixer after discharge was intended to compensate for the loss of mortar from the test batch.

2) All the fine and coarse aggregate was placed in the mixer. It was then started and the aggregate blended for 1/2-1 minutes during which time the small amount of water containing the sodium hydroxide was added if required.

3) With the mixer running the cement was added.

4) The contents of the mixer were mixed for three minutes during which time additional water if needed was added to adjust the slump to 80±10 mm.

5) The mixer was allowed to stand for three minutes during which time the open end was covered to prevent loss of moisture due to evaporation.

6) Final mixing of two minutes was performed and any additional water, if required, was added.

7) The test batch was now deposited in a clean, damp wheelbarrow and remixed by shovel until it appeared to be uniform.

1.2.4 Casting of Specimens

Slump, air content and density of concrete were measured in accordance with the appropriate CSA test methods.

A length gauge was used to set all gauge studs to the same dimension; this being 352.806 mm face-to-face internally.

Prism moulds were filled in approximately two equal layers, each layer compacted with the tamper. The concrete was worked into the corners around the gauge studs to ensure a homogeneous specimen. After rodding each layer, the concrete was spaded along the sides and ends of the mould with a trowel. The sides of the mould were than tapped with a rubber hammer to close the voids. The concrete was then struck off flush with the top of the mould and the surface smoothed with a few strokes of the trowel. After completion of the casting the specimens were placed in the moist curing room and covered with a polyethylene sheet for 23½±½ h at which time they were demoulded.

Immediately after demoulding, each prism was identified with an arrow at one end together with the specimen number, and then immersed in water at 23±2°C for 30±5 minutes. Upon removal from the water, each prism was measured for initial length and then placed in either the moist curing room or in storage containers in the high-temperature room as required.

Compressive strength concrete cylinders were cast, cured and tested in accordance with CSA A23.2.

All prism specimens were photographed at seven days for future reference.

1.2.5 Cleaning Equipment

All containers used to weigh materials were washed with water and dried before reuse to ensure no contamination between batches.

The tilting concrete mixer, wheelbarrow, slump cone, air meter, density measure and associated tools were washed with water, wiped with a rag and hosed down again and then allowed to dry before reuse.

The concrete prism moulds were disassembled after use and cleaned thoroughly in water. Care was taken to ensure that the moulds were not damaged during this process.

After cleaning and drying, the moulds were reassembled and coated with a light film of form oil.

1.3 Mix Designs and Casting Mortar Bars (ASTM C227-87)

1.3.1 Mix Designs

The mortar bars were proportioned as follows:

Material	Quantities to Produce 2 Mortar Bars Dry materials, g
Cement	300
Sand #4-#8	67.5
8-16	168.75
16-30	168.75
30-50	168.75
50-100	101.25

Water - an amount required to produce a flow of 105-120 with ten ½-inch drops of the flow table in six seconds.

The quantity of water required ranged from 145-205 grams. Individual record sheets showing actual quantities batched are attached to this Appendix (G).

1.3.2 Batching

The sand for the mortar bars was cumulatively weighed in a dry condition on a digital balance accurate to 0.01 g.

Cement for the mortar bars was weighed on a digital balance accurate to 0.01 g.

Mixing water for the mortar bars was weighed on a digital balance accurate to 0.01 g.

Sodium hydroxide for the mortar bars was weighed on a digital balance accurate to 0.01 g and added to the mix water.

The sodium hydroxide was dissolved in a small amount of the mix water and added to the mix before adding the final amount of mix water, needed to bring the mix to the required consistency.

1.3.3 Mixing

The cement, water, fine aggregate and sodium hydroxide (dissolved in the mix water where required) were added to the mortar mixer as outlined in ASTM C227, to achieve the proper consistency. Only the required amount of water needed to obtain the proper flow was used for each test.

1.3.4 Casting of Specimens

Mortar bar moulds were filled in approximately two equal layers, each layer compacted with the tamper. The mortar was worked into the corners and around the gauge studs to ensure a homogeneous specimen. The mortar was then struck off flush with the top of the mould and the surface smoothed with a few strokes of the trowel. After casting, the specimens were placed in the moist curing room and covered with a polyethylene sheet for 24±2 h, at which time they were demoulded.

The mortar bars were removed from the moulds at 24±2 h and, while being protected from loss of moisture, were measured and properly identified. An arrow was placed near one end together with the specimen number. The arrow indicates the top and front of the specimens when placing it in the length comparator. After initial measurement, the specimens were placed in the storage container and stored in the high-temperature room until further measurement was required.

All specimens were photographed at seven days for reference.

1.3.5 Cleaning Equipment

All containers used to weigh materials were washed with water and dried before reuse to ensure no contamination between batches.

The mortar mixer bowl, paddles, flow table and associated small tools were washed with water and dried between batches.

After use, the mortar bar moulds after use were disassembled and cleaned thoroughly in water. Care was taken to ensure that the moulds were not damaged during this process.

After cleaning and drying, the moulds were reassembled and coated with a light film of form oil.

1.4 Specimen Identification

The identification and reference system shown below was developed to identify and reference all specimens. The reference numbers identify the source type, i.e., natural gravel, sand or bedrock; the source aggregate location by reference to Section 6 of the report; the storage condition; the alkali content of the cement; and the casting sequence.

Specimen Identification System

Key:

R - coarse aggregate from bedrock
RS - manufactured sand from bedrock (standard mortar bars)
G - coarse aggregate from natural gravel
S - sand from natural sand and gravel
C - control sample
O - accelerated mortar bar test

Prism Identification:

G8 - 1A,B,C - typical identification code

G8 - G - aggregate type
- 8 - aggregate source refer to Section 6 of report

1A - numeral refers to storage condition and alkali content of individual specimens

1A,B,C - 0.94% Na_2O - 23°C
2A,B,C - 0.94% Na_2O - 38°C
3A,B,C - 1.25% Na_2O - 23°C
4A,B,C - 1.25% Na_2O - 38°C

Letter refers to individual specimen identification.

Prism specimens 1A,B,C and 2A,B,C were cast from the same batch. Prisms 3A,B,C and 4A,B,C were cast from a separate batch. All fine aggregate for prisms was from Guelph sand.

Mortar Bar Identification (RS or S)

Standard Mortar Bars

2A, 2B, 2C, 2D = 0.94% Na_2O - 38°C
4A, 4B, 4C, 4D = 1.25% Na_2O - 38°C

Accelerated Mortar Bar Identification (O)

2A, 2B, 2C, 2D = 0.92% Na_2O - 80°C immersed in 1N NaOH solution

Mortar bar specimens A and B were cast from one batch and C and D from a separate mortar batch.

1.5 Measurement

1.5.1 Prism Measurement

Accelerated test prisms were removed from the high-temperature room and cooled in their containers in the moist room for a period of 16-20 hours prior to measurement.

Prisms moist-cured at 23±2°C were immersed in water at 23±2°C for 30±5 minutes prior to measurement.

Before measuring the length of each specimen, the comparator gauge stud seats were examined to ensure no dirt or water was present. The reference bar was then placed in the comparator by raising the digital indicator shaft with a remote lifting device, inserting the reference bar in the lower gauge stud seat and then lowering the upper gauge stud seat with the device onto the reference bar.

One end of the invar bar was marked with an arrow, indicating the top of the reference bar. Another mark was placed on the end of the digital indicator stud seat so that this mark and the arrow would match when taking reference bar readings.

The reference bar was rotated at lest 360° in the gauge stud seats, the arrow on the bar aligned with mark on the upper seat and the digital dial indicator set to zero.

The concrete prisms were measured in much the same manner as was the invar reference bar. The length comparator was fabricated in such a way, however, that the prism weight was taken by the comparator frame with the tension supplied to the gauge studs through the gauge seats by means of the 5 kg counter weight for the lower stud and the spring tension of the dial indicator shaft for the top stud. Measurements were made to 0.001 mm.

1.5.2 Standard Mortar Bar Measurements

Mortar bars were removed from the high-temperature room and cooled at 23°C for a minimum of 16 hours prior to measurement.

Before measuring the length of each specimen, the gauge stud seats were examined to ensure no dirt or water was present. The reference bar was then placed in the comparator by raising the digital indicator shaft with a remote lifting device, inserting the reference bar in the lower gauge stud seat and then lowering the upper gauge stud seat with the remote on the reference bar.

One end of the invar reference bar used was marked with one arrow, indicating the top of the reference bar. Another mark was placed on the digital indicator gauge stud seat so that this mark and the arrow would match when taking reference bar readings.

The reference bar was rotated at least 360° in the gauge stud seats, the arrow on the bar aligned with the mark on the upper seat and the digital dial indicator set to zero.

The mortar bars were placed in the comparator in the same manner as the invar reference bar, rotated at least 360° with the arrow pointing up and to the front of the digital dial indicator. This length was then checked by repeating the procedure. If the measurement was the same then it was recorded and the next specimen measured. Measurements were made to 0.001 mm.

1.5.3 Accelerated Mortar Bar Measurements

The freshly cast mortar bars were placed in the moist curing room where the temperature was maintained at 23°C±2°C. After 24 hours±2 hours, the steel moulds were stripped, and specimens were placed in a hot water bath at a temperature of 80°C± for a period of 24 hours±2 hours, at the end of which time the initial specimen length readings were determined using the comparator. Following the establishment of the initial reading, each specimen was immersed in a 1 N, NaOH solution in a sealed plastic container which was maintained in an oven at a temperature of 80°C±5°C.

Specimens were retrieved from the NaOH bath and their lengths measured in accordance with the procedures of ASTM C227. Measurements were completed within a 10 second± duration and repeated every 24 hours±2 hours from the time of casting. Measurements were taken for a period of 14 working days.

1.6 Calculations and Plotting

The difference in length between the specimen and the reference bar was obtained directly from the digital micrometer; the micrometer having first been set to zero with the reference bar in place. Each measurement was obtained to a reading accuracy of 0.001 mm.

These readings were typed directly into the appropriate cells of a purpose-made computer spreadsheet, together with the actual date of measurement. For each specimen, the optimum dates of measurement (respectively 1, 7, 14, 28, 56, 84, 112, 168, 365, 547 and 730 days after casting for prisms; 1, 14, 31, 61, 91, 122, 183, 274, 265, 547 and 730 days for standard mortar bars and every day for approximately 20 days for the accelerated mortar bars were generated by the computer to serve as a reminder. Individual measurements were subtracted from the initial reading (i.e., at day 1 for prisms and mortar bars and day 2 for accelerated mortar bars), and the difference or elongation then expressed as a percentage of the original sample length between gauge studs. The mean elongation for each set was calculated; negative elongation indicating shrinkage relative to original length. A typical data sheet is shown in Table G2. Detailed data sheets for all specimens are attached in Appendix H.

For each sample, four sets of three prisms and two sets of four mortar bars were cast; each set representing different combinations of temperature (23 or 38°C) and cement alkalinity (0.94 or 1.25 percent) or accelerated storage at 80°C as indicated in Section 1.4. The mean elongation or expansion of each of the sets was then plotted against the time in days since casting; this plot being generated automatically from the spreadsheet. Individual plots are presented in Appendix 1.

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R1 CSA A23.2 14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	27-Mar-87	Bin 1	0.94	23
2A,B,C	27-Mar-87	Box R1-2	0.94	38
3A,B,C	27-Mar-87	Bin 1	1.25	23
4A,B,C	27-Mar-87	Box R1-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
28-Mar-87	28-Mar-87	1	2.722	3.676	2.504	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.728	3.683	2.511	0.002	0.002	0.002	0.002
10-Apr-87	10-Apr-87	14	2.736	3.689	2.518	0.004	0.004	0.004	0.004
24-Apr-87	24-Apr-87	28	2.739	3.695	2.525	0.005	0.005	0.006	0.005
22-May-87	22-May-87	56	2.719	3.673	2.504	-0.001	-0.001	0.000	-0.001
19-Jun-87	19-Jun-87	84	2.717	3.675	2.502	-0.001	.000	-0.001	-0.001
17-Jul-87	17-Jul-87	112	2.724	3.683	2.506	0.001	0.002	0.001	0.001
11-Sep-87	11-Sep-87	168	2.724	3.683	2.506	0.001	0.002	0.001	0.001
08-Jan-88	08-Jan-88	287	2.729	3.687	2.513	0.002	0.003	0.003	0.003
26-Mar-88	26-Mar-88	365				0.000	0.000	0.000	0.000
24-Sep-88	24-Sep-88	547				0.000	0.000	0.000	0.000
26-Mar-89	26-Mar-89	730				0.000	0.000	0.000	0.000

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
28-Mar-87	28-Mar-87	1	2.780	2.986	2.845	0.000	0.000	0.000	0.000
04-Apr-87	03-Apr-87	8	2.786	2.994	2.855	0.002	0.002	0.003	0.002
10-Apr-87	10-Apr-87	14	2.784	2.990	2.848	0.001	0.001	0.001	0.001
24-Apr-87	24-Apr-87	28	2.810	3.016	2.873	0.009	0.009	0.008	0.008
22-May-87	22-May-87	56	2.794	3.001	2.860	0.004	0.004	0.004	0.004
19-Jun-87	19-Jun-87	84	2.799	3.007	2.863	0.005	0.006	0.005	0.005
17-Jul-87	17-Jul-87	112	2.809	3.019	2.874	0.008	0.009	0.008	0.009
11-Sep-87	11-Sep-87	168	2.817	3.031	2.883	0.010	0.013	0.011	0.011
08-Jan-88	08-Jan-88	287	2.850	3.077	2.912	0.020	0.026	0.019	0.022
26-Mar-88	26-Mar-88	365				0.000	0.000	0.000	0.000
24-Sep-88	24-Sep-88	547				0.000	0.000	0.000	0.000
26-Mar-89	26-Mar-89	730				0.000	0.000	0.000	0.000

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R1 CSA A23.2 14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	27-Mar-87	Bin 1	0.94	23
2A,B,C	27-Mar-87	Box R1-2	0.94	38
3A,B,C	27-Mar-87	Bin 1	1.25	23
4A,B,C	27-Mar-87	Box R1-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
28-Mar-87	28-Mar-87	1	2.575	2.995	2.808	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.566	2.986	2.797	-0.003	-0.003	-0.003	-0.003
10-Apr-87	10-Apr-87	14	2.568	2.987	2.800	-0.002	-0.002	-0.002	-0.002
24-Apr-87	24-Apr-87	28	2.570	2.990	2.803	-0.001	-0.001	-0.001	-0.001
22-May-87	22-May-87	56	2.547	2.974	2.780	-0.008	-0.006	-0.008	-0.007
19-Jun-87	19-Jun-87	84	2.552	2.971	2.779	-0.007	-0.007	-0.008	-0.007
17-Jul-87	17-Jul-87	112	2.560	2.972	2.785	-0.004	-0.007	-0.007	-0.006
11-Sep-87	11-Sep-87	168	2.556	2.970	2.783	-0.005	-0.007	-0.007	-0.007
08-Jan-88	08-Jan-88	287	2.559	2.975	2.787	-0.005	-0.006	-0.006	-0.005
26-Mar-88	26-Mar-88	365				0.000	0.000	0.000	0.000
24-Sep-88	24-Sep-88	547				0.000	0.000	0.000	0.000
26-Mar-89	26-Mar-89	730				0.000	0.000	0.000	0.000

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
28-Mar-87	28-Mar-87	1	2.906	2.189	2.020	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.895	2.176	2.005	-0.003	-0.004	-0.004	-0.004
10-Apr-87	10-Apr-87	14	2.888	2.174	2.005	-0.005	-0.004	-0.004	-0.005
24-Apr-87	24-Apr-87	28	2.910	2.196	2.028	0.001	0.002	0.002	0.002
22-May-87	22-May-87	56	2.890	2.178	2.005	-0.005	-0.003	-0.004	-0.004
19-Jun-87	19-Jun-87	84	2.890	2.176	2.009	-0.005	-0.004	-0.003	-0.004
17-Jul-87	17-Jul-87	112	2.895	2.179	2.011	-0.003	-0.003	-0.003	-0.003
11-Sep-87	11-Sep-87	168	2.895	2.184	2.013	-0.003	-0.001	-0.002	-0.002
08-Jan-88	08-Jan-88	287	2.914	2.204	2.034	0.002	0.004	0.004	0.003
26-Mar-88	26-Mar-88	365				0.000	0.000	0.000	0.000
24-Sep-88	24-Sep-88	547				0.000	0.000	0.000	0.000
26-Mar-89	26-Mar-89	730				0.000	0.000	0.000	0.000

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS1 - 2A & B	RS1 - 2C & D
Date	87 05 27	87 05 27
Time	1540	1635

Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	173.00	180.26
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--

Flow	107	110
Air Content, %	3.6	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS1 - 4A & B	RS1 - 4C & D
Date		87 05 28	87 05 28
Time		1045	1115
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		180.95	180.71
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		112	117
Air Content, %		3.7	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS2 - 2A & B	RS2 - 2C & D
Date	87 05 28	87 05 28
Time	1150	1350
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	184.97	189.95
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	--
Flow	105	110
Air Content, %	5.3	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS2 - 4A & B	RS2 - 4C & D
Date		87 05 28	87 05 28
Time		1420	1605
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		189.95	184.01
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		118	115
Air Content, %		5.3	3.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS3 - 2A & B	RS3 - 2C & D
Date	87 05 28	87 05 28
Time	1500	1540
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	180.57	181.89
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--
Flow	108	113
Air Content, %	5.3	5.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS3 - 4A & B	RS3 - 4C & D
Date	87 05 29	87 05 29
Time	0955	1040
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	180.62	177.24
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	120	115
Air Content, %	3.6	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS4 - 2A & B	RS4 - 2C & D
Date	87 05 29	87 05 29
Time	1110	1145
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	180.04	177.67
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	--
Flow	115	115
Air Content, %	3.6	5.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS4 - 4A & B	RS4 - 4C & D
Date	87 05 29	87 05 29
Time	1325	1345
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	174.78	174.47
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	114	109
Air Content, %	4.8	3.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS5-2A & B	RS5-2C & D
Date	87-05-29	87-05-29
Time	14:00	14:25
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	175.59	171.49
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	116	115
Air Content, %	8.9	8.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS5-4A & B	RS5-4C & D
Date	87-06-01	87-06-01
Time	09:15	09:45
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	171.95	171.90
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	115	116
Air Content, %	7.5	8.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS6-2A & B	RS6-2C & D
Date	87-06-01	87-06-01
Time	10:55	11:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	174.81	175.10
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	112	112
Air Content, %	4.6	3.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS6-4A & B	RS6-4C & D
Date		87-06-01	87-06-01
Time		11:45	13:30
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		175.12	173.00
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		118	116
Air Content, %		3.7	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS7-2A & B	RS7-2C & D
Date		87-06-02	87-06-01
Time		13:50	14:35
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		177.13	180.55
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		—	—
Flow		109	112
Air Content, %		4.4	2.5

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS7-4A & B	RS7-4C & D
Date	87-06-01	87-06-02
Time	14:55	10:25
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	177.05	176.97
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	112	112
Air Content, %	5.2	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS8-2A & B	RS8-2C & D
Date	87-06-02	87-06-02
Time	11:00	11:25
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	175.16	174.97
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	110	108
Air Content, %	3.7	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS8-4A & B	RS8-4C & D
Date		87-06-02	87-06-03
Time		11:35	14:00
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		175.00	175.88
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		110	107
Air Content, %		4.3	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS9-2A & B	RS9-2C & D
Date	87-06-02	87-06-02
Time	14:10	14:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	174.91	179.92
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	105	110
Air Content, %	7.1	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS9-4A & B	RS9-4C & D
Date	87-06-02	87-06-03
Time	15:45	10:45
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	183.12	180.10
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	110	116
Air Content, %	2.7	3.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS10-2A & B	RS10-2C & D
Date	87-06-04	87-06-03
Time	11:15	11:26
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	181.32	177.04
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	118	114
Air Content, %	6.9	6.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS10-4A & B	RS10-4C & D
Date	87-06-03	87-06-04
Time	11:45	14:50
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	175.14	175.10
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	113	108
Air Content, %	7.1	6.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS11-2A & B	RS11-2C & D
Date	87-06-03	87-06-03
Time	14:30	14:45
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	175.90	177.05
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	107	111
Air Content, %	4.6	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS11-4A & B	RS11-4C & D
Date	87-06-03	87-06-04
Time	15:30	10:45
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	177.41	177.30
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	110	118
Air Content, %	4.4	6.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS12-2A & B	RS12-2C & D
Date	87-06-04	87-06-04
Time	11:50	13:20
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	198.16	203.75
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	106	108
Air Content, %	5.3	4.8

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS12-4A & B	RS12-4C & D
Date	87-06-08	87-06-04
Time	13:40	15:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	203.71	205.25
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	111	118
Air Content, %	6.4	7.8

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS13-2A & B	RS13-2C & D
Date	87-06-04	87-06-04
Time	14:10	14:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	177.32	177.26
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	112	110
Air Content, %	3.6	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS13-4A & B	RS13-4C & D
Date	87-06-05	87-06-05
Time	09:30	10:50
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	177.53	176.01
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	118	116
Air Content, %	7.1	7.1

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS14-2A & B	RS14-2C & D
Date		87-06-08	87-06-05
Time		16:10	11:50
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		192.58	194.92
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		—	—
Flow		107	118
Air Content, %		5.3	4.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS14-4A & B	RS14-4C & D
Date	87-06-10	87-06-05
Time	09:50	14:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	192.00	192.97
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	113	116
Air Content, %	5.3	8.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS15-2A & B	RS15-2C & D
Date	87-06-05	87-06-05
Time	15:00	15:50
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	180.11	180.18
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	109	107
Air Content, %	9.8	9.8

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS15-4A & B	RS15-4C & D
Date		87-06-09	87-06-08
Time		10:45	09:45
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		180.09	180.11
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		111	113
Air Content, %		7.1	10.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	RS16-2A & B	RS16-2C & D
Date	87-06-08	87-06-08
Time	10:35	10:50
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	180.12	175.62
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	120	120
Air Content, %	5.3	7.1

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		RS16-4A & B	RS16-4C & D
Date		87-06-08	87-06-09
Time		11:15	14:50
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		170.06	170.18
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		114	112
Air Content, %		5.7	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S1-2A & B	S1-2C & D
Date		87-06-10	87-06-09
Time		11:25	11:25
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		157.13	157.18
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		—	—
Flow		112	112
Air Content, %		5.3	4.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S1-4A & B	S1-4C & D
Date	87-06-09	87-06-09
Time	11:45	14:30
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	154.97	155.08
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	110	116
Air Content, %	3.7	6.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S2-2A & B	S2-2C & D
Date	87-06-09	87-06-09
Time	16:00	16:18
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	155.51	154.65
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	110	112
Air Content, %	3.6	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S2-4A & B	S2-4C & D
Date		87-06-09	87-06-11
Time		16:30	11:10
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		154.99	155.08
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		113	116
Air Content, %		3.7	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S3-2A & B	S3-2C & D
Date	87-06-10	87-06-10
Time	11:40	14:15
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	155.06	154.98
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	113	117
Air Content, %	2.7	3.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S3-4A & B	S3-4C & D
Date		87-06-10	87-06-10
Time		14:45	15:50
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		153.00	152.90
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		116	114
Air Content, %		3.7	4.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S4-2A & B	S4-2C & D
Date	87-06-10	87-06-10
Time	16:10	16:25
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	156.99	155.98
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	116	115
Air Content, %	3.6	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S4-4A & B	S4-4C & D
Date	87-06-11	87-06-11
Time	10:35	10:55
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	154.04	154.93
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	112	114
Air Content, %	3.6	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S5-2A & B	S5-2C & D
Date	87-06-11	87-06-11
Time	11:40	13:15
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	151.03	150.64
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	114	113
Air Content, %	4.4	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S5-4A & B	S5-4C & D
Date		87-06-11	87-06-11
Time		13:40	14:10
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		150.46	150.07
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		115	112
Air Content, %		2.7	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S6-2A & B	S6-2C & D
Date	87-06-11	87-06-11
Time	15:00	15:45
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	153.17	153.02
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	114	112
Air Content, %	3.9	5.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S6-4A & B	S6-4C & D
Date	87-06-12	87-06-12
Time	09:45	10:05
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	151.48	151.02
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	111	112
Air Content, %	4.8	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S7-2A & B	S7-2C & D
Date		87-06-12	87-06-12
Time		10:55	11:10
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		153.38	152.23
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		—	—
Flow		115	110
Air Content, %		3.9	4.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S7-4A & B	S7-4C & D
Date		87-06-12	87-06-12
Time		12:00	13:00
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		152.04	152.17
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		112	114
Air Content, %		5.3	5.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S8-2A & B	S8-2C & D
Date	87-06-12	87-06-12
Time	13:20	13:50
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	152.18	150.14
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	117	116
Air Content, %	5.3	5.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S8-4A & B	S8-4C & D
Date		87-06-12	87-06-15
Time		14:20	10:40
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		148.32	148.09
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		116	115
Air Content, %		3.6	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S9-2A & B	S9-2C & D
Date	87-06-15	87-06-15
Time	10:55	11:10
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	151.00	150.37
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	112	112
Air Content, %	5.5	6.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S9-4A & B	S9-4C & D
Date		87-06-15	87-06-15
Time		11:25	11:37
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		149.01	150.38
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		108	112
Air Content, %		7.1	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S10-2A & B	S10-2C & D
Date	87-06-15	87-06-15
Time	11:50	14:05
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	152.47	153.47
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	108	108
Air Content, %	3.6	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S10-4A & B	S10-4C & D
Date	87-[illegible]6-15	87-06-15
Time	14:25	14:40
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	153.04	153.66
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	116	113
Air Content, %	2.8	3.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S11 - 2A & B	S11 - 2C & D
Date		87 06 16	87 06 16
Time		1035	1050
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		150.16	150.06
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		--	--
Flow		114	115
Air Content, %		3.6	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	SI1 - 4A & B	S11 - 4C & D
Date	87 06 16	87 06 16
Time	1105	1120
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	148.00	147.99
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	115	115
Air Content, %	3.4	2.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S12 - 2A & B	S12 - 2C & D
Date	87 06 16	87 06 16
Time	1135	1145
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	150.87	147.07
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--
Flow	118	115
Air Content, %	5.3	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S12 - 4A & B	S12 - 4C & D
Date	87 06 16	87 06 16
Time	1430	1445
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	146.04	146.05
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	114	115
Air Content, %	5.3	5.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S13 - 2A & B	S13 - 2C & D
Date	87 06 16	87 06 17
Time	1500	1030
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	149.98	150.16
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	—	—
Flow	110	108
Air Content, %	3.6	3.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S13 - 4A & B	S13 - 4C & D
Date	87 06 17	87 06 17
Time	1050	1105
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	150.09	150.08
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	116	114
Air Content, %	2.0	1.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S14 - 2A & B	S14 - 2C & D
Date		87 06 17	87 06 18
Time		1125	1445
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		150.19	150.86
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		—	—
Flow		110	112
Air Content, %		4.6	5.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S14 - 4A & B	S14 - 4C & D
Date	87 06 17	87 06 17
Time	1155	1430
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	149.93	148.17
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	119	112
Air Content, %	5.5	5.9

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	S15 - 2A & B	S15 - 2C & D
Date	87 06 17	87 06 17
Time	1450	1535
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	202.52	201.96
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--
Flow	112	112
Air Content, %	10.7	7.1

Note: Only 2 sizes of sand were available for the test
Pass. 30 and Ret. 50 and Pass. 50 Ret. 100
Quantities used were Ret. 50 - 573.75 g
Ret. 100- 101.25

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		S15 - 4A & B	S15 - 4C & D
Date		87 06 19	87 06 18
Time		1545	1145
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		203.33	203.92
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		1.20	1.20
Flow		106	112
Air Content, %		8.9	5.3

Note: Only 2 sizes of sand were available for the test
Pass. 30 and Ret. 50 and Pass. 50 Ret. 100
Quantities used were Ret. 50 - 573.75 g
Ret. 100 - 101.25

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CRS1 - 2A & B	CRS1 - 2C & D
Date	87 05 25	87 05 25
Time	1430	1450
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	160.39	160.06
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--
Flow	112	108
Air Content, %	4.4	5.7

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CRS1 - 4A & B	CRS1 - 4C & D
Date	87 05 26	87 05 26
Time	0910	0935
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	160.34	159.94
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	114	114
Air Content, %	3.6	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CS2 - 2A & B	CS2 - 2C & D
Date	87 05 26	87 05 26
Time	1140	1330
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	160.00	163.66
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaCH), g (0.94% - 1.25%)	--	--
Flow	105	108
Air Content, %	3.7	3.0

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CS2 - 4A & B	CS2 - 4C & D
Date	87 05 27	87 05 26
Time	1645	1420
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	162.81	162.92
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	108	114
Air Content, %	3.6	4.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location		CRS3 - 2A & B	CRS3 - 2C & D
Date		87 05 26	87 05 26
Time		1500	1535
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		162.00	163.57
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)		--	--
Flow		109	110
Air Content, %		3.6	4.4

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CRS3 - 4A & B	CRS3 - 4C & D
Date	87 05 27	87 05 27
Time	0905	1040
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	163.31	163.06
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	114	116
Air Content, %	5.3	4.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CRS4 - 2A & B	CRS4 - 2C & D
Date	87 05 27	87 05 27
Time	1120	1355
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	162.89	163.15
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	--	--
Flow	108	111
Air Content, %	5.3	6.2

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CRS4 - 4A & B	CRS4 - 4C & D
Date	87 05 27	87 05 27
Time	1415	1440
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	163.18	163.16
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	110	112
Air Content, %	5.3	5.3

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CS5 - 2A & B	CS5 - 2C & D
Date	87 05 25	87 05 25
Time	1000	1100
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	150.00	145.00
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	——	——
Flow	120	114
Air Content, %	4.6	2.8

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

MORTAR BAR MIX DESIGN - ASTM C227

Sample Location	CS5 - 4A & B	CS5 - 4C & D
Date	87 05 25	87 05 25
Time	1130	1345
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	145.06	145.01
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used (NaOH), g (0.94% - 1.25%)	1.20	1.20
Flow	112	114
Air Content, %	3.0	3.6

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OR3	OR3
Date		August 8, 1988	August 8, 1988
Time		1430	1455
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		145.01	143.0
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		116.5	115.5
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OG7	OG7
Date		August 8, 1988	August 8, 1988
Time		1535	1555
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		140.43	140.06
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		111.0	112.5
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

	Bars A & B	Bars C & D
Sample Location	OR1 A & B	OR1 C & D
Date	August 8, 1988	August 8, 1988
Time	1615	1630
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	140.27	140.04
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used	None	None
Flow	111.5	113.0
Air Content, %	-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

	Bars A & B	Bars C & D
Sample Location	OR5	OR5
Date	August 9, 1988	August 9, 1988
Time	1035	1055
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	140.03	139.01
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used	None	None
Flow	111.5	115.0
Air Content, %	-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OR7	OR7
Date		August 9, 1988	August 9, 1988
Time		1115	1135
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		137.63	139.54
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		107.5	111.0
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OG8	OG8
Date		August 9, 1988	August 9, 1988
Time		1330	1345
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		139.00	139.20
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		113.0	113.5
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OG3	OG3
Date		August 9, 1988	August 9, 1988
Time		1555	1625
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		139.09	140.15
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		105.5	108.0
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OR8	OR8
Date		August 9, 1988	August 9, 1988
Time		1645	1700
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		141.08	141.05
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		110.0	111.0
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

	Bars A & B	Bars C & D
Sample Location	OR24	OR24
Date	August 10, 1988	August 10, 1988
Time	1110	1125
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	140.95	139.82
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used	None	None
Flow	111.0	115.5
Air Content, %	-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OR4	OR4
Date		August 10, 1988	August 10, 1988
Time		1200	1215
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		140.30	139.18
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		116.5	116.5
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OR9	OR9
Date		August 10, 1988	August 10, 1988
Time		1350	1415
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		139.03	140.24
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		109.0	111.0
Air Content, %		-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

	Bars A & B	Bars C & D
Sample Location	OR2	OR2
Date	August 10, 1988	August 10, 1988
Time	1610	1625
Material	Quantities Used Per Batch (Dry Aggregates)	
Cement, g	300	300
Water, g	140.75	140.76
Sand, g - # 8	67.50	67.50
16	168.75	168.75
30	168.75	168.75
50	168.75	168.75
100	101.25	101.25
Total Sand	675.00	675.00
Extra Alkali Used	None	None
Flow	110.0	111.5
Air Content, %	-	-

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

ACCELERATED MORTAR BAR MIX DESIGN - ASTM C227

		Bars A & B	Bars C & D
Sample Location		OG1	OG1
Date		August 10, 1988	August 10, 1988
Time		1650	1705
Material		Quantities Used Per Batch (Dry Aggregates)	
Cement, g		300	300
Water, g		140.26	140.21
Sand, g -	# 8	67.50	67.50
	16	168.75	168.75
	30	168.75	168.75
	50	168.75	168.75
	100	101.25	101.25
Total Sand		675.00	675.00
Extra Alkali Used		None	None
Flow		109.0	110.5
Air Content, %		-	-

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R1

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	648	0.246
20 - 5 mm	1248	0.456
Air	2%	0.020
TOTALS	2386	1.000
Sand, %	35	
Paste, m^3	0.298	
Sand	0.702 x 2.638 x 0.35 x 1000	
20 - 5 mm	0.702 x 2.736 x 0.65 x 1000	

	Sand	20 - 5 mm
Relative Density -	2.638	2.736
Fineness Modulus -	2.5	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R2

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	741	0.281
20 - 5 mm	1129	0.421
Air	2%	0.020
TOTALS	2360	1.000
Sand, %	40	
Paste, m^3	0.298	
Sand	0.702 x 2.638 x 0.40 x 1000	
20 - 5 mm	0.702 x 2.681 x 0.60 x 1000	

	Sand	20 - 5 mm
Relative Density -	2.638	2.681
Fineness Modulus -	2.54	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R3

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	746	0.283
20 - 5 mm	1165	0.424
Air	1.5%	0.015
TOTALS	2401	1.000
Sand, %	40	
Paste, m^3	0.293	
Sand	0.707 x 2.638 x 0.4 x 1000	
20 - 5 mm	0.707 x 2.747 x 0.6 x 1000	

	Sand	20 - 5 mm
Relative Density -		
Fineness Modulus -		---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R4

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	746	0.283
20 - 5 mm	1174	0.424
Air	1.5%	0.015
TOTALS	2410	1.000
Sand, %	40	
Paste, m^3	0.293	
Sand	0.707 x 2.638 x 0.4 x 1000	
20 - 5 mm	0.707 x 2.767 x 0.6 x 1000	

	Sand	20 - 5 mm
Relative Density -	2.638	2.767
Fineness Modulus -	2.54	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R5

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	746	0.283
20 - 5 mm	1152	0.424
Air	1.5%	0.015
TOTALS	2388	1.0
Sand, %	40	
Paste, m^3	0.293	
Sand	0.707 x 2.638 x .40	
20 - 5 mm	0.707 x 2.716 x .60	

	Sand	20 - 5 mm
Relative Density -	2.638	2.716
Fineness Modulus -	2.5	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R6

Material	Quantities Per Cubic Metre (SSD Aggregates) Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1150	0.427
Air	1.5	0.015
TOTALS	2386	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.692	

	Sand	20 - 5 mm
Relative Density -	2.638	2.692
Fineness Modulus -	2.54	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R7

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1154	0.427
Air	1.5	0.015
TOTALS	2390	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.702 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.702
Fineness Modulus -	2.54	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R8

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1152	0.427
Air	1.5	0.015
TOTALS	2388	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.697 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.697
Fineness Modulus -	2.54	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R9

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1149	0.427
Air	1.5	0.015
TOTALS	2385	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.690 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.690
Fineness Modulus -	2.54	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R10

Material	Quantities Per Cubic Metre (SSD Aggregates) Mass, kg	Quantities Per Cubic Metre (SSD Aggregates) Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1122	0.427
Air	1.5	0.015
TOTALS	2358	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.627 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.627
Fineness Modulus -	2.516	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R11

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1113	0.427
Air	1.5	0.015
TOTALS	2349	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.605 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.605
Fineness Modulus -	2.516	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R12

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1083	0.427
Air	1.5	0.015
TOTALS	2319	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.536	

	Sand	20 - 5 mm
Relative Density -	2.638	2.536
Fineness Modulus -	2.516	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R13

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1122	0.427
Air	1.5	0.015
TOTALS	2358	1.000
Sand, %	20	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.627	

	Sand	20 - 5 mm
Relative Density -	2.638	2.627
Fineness Modulus -	2.516	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R14

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1094	0.427
Air	1.5	0.015
TOTALS	2330	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.560 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.560
Fineness Modulus -	2.516	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

RI5

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1135	0.427
Air	1.5	0.015
TOTALS	2371	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.657	

	Sand	20 - 5 mm
Relative Density -	2.638	2.657
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R16

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1226	0.427
Air	1.5	0.015
TOTALS	2462	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.871 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.871
Fineness Modulus -	2.563	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R17

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1104	0.427
Air	1.5	0.015
TOTALS	2340	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.4 x 2.584	

	Sand	20 - 5 mm
Relative Density -	2.638	2.584
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R18

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1118	0.427
Air	1.5	0.015
TOTALS	2354	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.617	

	Sand	20 - 5 mm
Relative Density -	2.638	2.617
Fineness Modulus -	2.563	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R19

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1118	0.427
Air	1.5	0.015
TOTALS	2354	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.617 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.617
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R20

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1220	0.427
Air	1.5	0.015
TOTALS	2456	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.857	

	Sand	**20 - 5 mm**
Relative Density -	2.638	2.857
Fineness Modulus -	2.563	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R21

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1188	0.427
Air	1.5	0.015
TOTALS	2424	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.780	

	Sand	20 - 5 mm
Relative Density -	2.638	2.780
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R22

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1150	0.427
Air	1.5	0.015
TOTALS	2386	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 0.4 x 2.638	
20 - 5 mm	0.712 x 0.6 x 2.692	

	Sand	20 - 5 mm
Relative Density -	2.638	2.692
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R23

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1218	0.427
Air	1.5	0.015
TOTALS	2454	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.850 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.850
Fineness Modulus -	2.563	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R24

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1165 q	0.427
Air	1.5	0.015
TOTALS	2401	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.728 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.728
Fineness Modulus -	2.590	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

R25

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1154	0.427
Air	1.5	0.015
TOTALS	2390	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.702 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.702
Fineness Modulus -	2.590	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

CR1

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1145	0.427
Air	1.5	0.015
TOTALS	2381	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.680 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.680
Fineness Modulus -	2.590	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

CG2

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1158	0.427
Air	1.5	0.015
TOTALS	2394	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.712 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.712
Fineness Modulus -	2.590	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

CR3

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	175	0.175
Sand	751	0.285
20 - 5 mm	1152	0.427
Air	1.5	0.015
TOTALS	2388	1.000
Sand, %	40	
Paste, m^3	0.288	
Sand	0.712 x 2.638 x 0.4	
20 - 5 mm	0.712 x 2.698 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.698
Fineness Modulus -	2.590	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

CR4

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	180	0.180
Sand	746	0.283
20 - 5 mm	1153	0.424
Air	1.5	0.015
TOTALS	2389	1.000
Sand, %	40	
Paste, m^3	0.293	
Sand	0.707 x 2.638 x 0.40 x 1000	
20 - 5 mm	0.707 x 2.719 x 0.60 x 1000	

	Sand	20 - 5 mm
Relative Density -	2.638	2.719
Fineness Modulus -	2.54	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G1

Material	Quantities Per Cubic Metre (SSD Aggregates) Mass, kg	Quantities Per Cubic Metre (SSD Aggregates) Volume, m^3
Cement	310	0.098
Water	170	0.170
Sand	757	0.287
20 - 5 mm	1119	0.430
Air	1.5	0.015
TOTALS	2356	1.000
Sand, %	40	
Paste, m^3	0.283	
Sand	0.717 x 2.638 x .40	
20 - 5 mm	0.717 x 2.602 x 0.60	

	Sand	20 - 5 mm
Relative Density -	2.638	2.602
Fineness Modulus -	2.590	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G2 - 1 & 2

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	170	0.170
Sand	757	0.287
20 - 5 mm	1144	0.430
Air	1.5	0.015
TOTALS	2381	1.000
Sand, %	40	
Paste, m^3	0.283	
Sand	0.717 x 2.638 x 0.4	
20 - 5 mm	0.717 x 2.660 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.660
Fineness Modulus -	2.590	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G2 - 3 & 4

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1152	0.433
Air	1.5	0.015
TOTALS	2389	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.660	

	Sand	20 - 5 mm
Relative Density -	2.638	2.660
Fineness Modulus -	2.590	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G3

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1149	0.433
Air	1.5	0.015
TOTALS	2386	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.653	

	Sand	20 - 5 mm
Relative Density -	2.638	2.653
Fineness Modulus -	2.698	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G4

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1142	0.433
Air	1.5	0.015
TOTALS	2379	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 2.638 x 0.4	
20 - 5 mm	0.722 x 2.637 x 0.6	

	Sand	20 - 5 mm
Relative Density -	2.638	2.637
Fineness Modulus -	2.698	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G5

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1152	0.433
Air	1.5	0.015
TOTALS	2389	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.660	

	Sand	20 - 5 mm
Relative Density -	2.638	2.660
Fineness Modulus -	2.698	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G6

Material	Quantities Per Cubic Metre (SSD Aggregates) Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1148	0.433
Air	1.5	0.015
TOTALS	2385	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.651	

	Sand	20 - 5 mm
Relative Density -	2.638	2.651
Fineness Modulus -	2.698	---

File: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G7

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1154	0.433
Air	1.5	0.015
TOTALS	2391	1.000
Sand, %		
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.663	

	Sand	20 - 5 mm
Relative Density -	2.638	2.663
Fineness Modulus -	2.698	---

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY

CONCRETE MIX DESIGN - PRISM TEST

G8

Material	Quantities Per Cubic Metre (SSD Aggregates)	
	Mass, kg	Volume, m^3
Cement	310	0.098
Water	165	0.165
Sand	762	0.289
20 - 5 mm	1170	0.433
Air	1.5	0.015
TOTALS	2407	1.000
Sand, %	40	
Paste, m^3	0.278	
Sand	0.722 x 0.4 x 2.638	
20 - 5 mm	0.722 x 0.6 x 2.701	

	Sand	20 - 5 mm
Relative Density -	2.638	2.701
Fineness Modulus -	2.698	---

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: Rl - 1 & 2
DATE: 87 03 27
TIME: 1000

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	311
Water	180	7.200	—	--	—	7.259	0.00726	182
Sand	648	25.920	25.790	28.736	2.946	25.920	0.00983	651
C.A. 20-14 mm	416	16.640	16.532					
14-10 mm	416	16.640	16.532	50.976	1.056	49.92	0.01825	1253
10- 5 mm	416	16.640	16.532					
Air	2%	2%	--	--	--	1.4%	0.00056	1.4%
Totals	2386	95.440	—	—	4.002	95.499	0.03984	2397

Slump, mm - 60
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2445
Workability - Harsh
Concrete Temperature, °C - 20
W/C - 0.585
Comp. Str. @ 28 d, MPa - 33.0, 32.0

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.736
Absorption, % -	0.50	0.65
Fineness Modulus -	2.540	—
Total Water Used - (excess water in aggregates plus extra required)	7.259	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R2 - 1 & 2

DATE: 87 03 30

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	180	7.200	--	--	--	7.089	0.00709	179
Sand	741	29.640	29.492	33.177	3.685	29.640	0.01124	747
C.A. 20-14 mm	376.333	15.053	14.925					
14-10 mm	376,333	15.053	14.925	46.099	0.94	45.159	0.01684	1139
10- 5 mm	376.333	15.053	14.925					
Air	2%	2%	--	--	--	1.4%	0.00055	1.4%
Totals	2360	94.399	—	—	4.625	94.288	0.03966	2378

Slump, mm - 60
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2407
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.572
Comp. Str. @ 28 d, MPa - 32.2, 33.2

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.681
Absorption, %	-	0.50	0.86
Fineness Modulus	-	2.540	--
Total Water Used (excess water in aggregates plus extra required)	-	7.089	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R2 - 3 & 4
DATE: 87 03 30
TIME: 1445

Material	Design Mix Proportions (SSD Agg.) kg/m³	Design Mix Proportions (SSD Agg.) 0.04 m³ (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m³	Actual Mix Proportions (SSD Agg.) kg/m³
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	180	7,200	--	--	--	7,203	0.00720	181
Sand	741	29,640	29,492	33.226	3.734	29,640	0.01124	745
C.A. 20-14 mm	376,333	15,053	14,925					
14-10 mm	376,333	15,053	14.925	46.180	1.405	45.159	0.01684	1135
10- 5 mm	376.333	15,053	14,925					
Air	2%	2%	--	--	--	1.4	0.00056	1.4%
Totals	2360	94,399	--	--	5.139	94.402	0.03978	2373

Slump, mm - 70
Air Content, % - 1.4
Unit Weight, kg/m³ - 2420
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.581
Comp. Str. @ 28 d, MPa - 34.1, 33.1

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.681
Absorption, %	-	0.50	0.86
Fineness Modulus	-	2,540	
Total Water Used (excess water in aggregates plus extra required)	-	7.203	
Extra alkali used (NaOH) (0.94 1.25)	-	49.6	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R3 - 1 & 2

DATE: 87 03 31

TIME: 0945

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.003941	310
Water	180	7.200	--	--	--	7.228	0.00723	181
Sand	746	29.840	29.692	33.382	3.690	29.840	0.01131	746
C.A. 20-14 mm	388.333	15.533	15.466					
14-10 mm	388.333	15.533	15.466	47.605	1.006	46.599	0.01696	1165
10- 5 mm	388.333	15.533	15.466					
Air	1.5	1.5	--	--	--	1.6%	0.00064	1.6%
Totals	2401	96.039	—	--	4.696	96.067	0.04001	2402

Slump, mm - 90

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2430

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.583

Comp. Str. @ 28 d, MPa - 30.2, 31.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.747
Absorption, % -	0.50	0.43
Fineness Modulus -	2.540	—
Total Water Used - (excess water in aggregates plus extra required)	7.228	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R3 - 3 & 4

DATE: 87 03 31

TIME: 1415

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$0.04 m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	310
Water	180	7.200	--	--	--	7.103	0.00710	178
Sand	746	29.840	29.692	33.427	3.587	29.840	0.01131	747
C.A. 20-14 mm	388.333	15.533	15.466					
14-10 mm	388.333	15.533	15.466	47.601	1.011	46.599	0.01696	1166
10- 5 mm	388.333	15.533	15.466					
Air	1.5	1.5	--	--	--	1.6%	0.00064	1.6%
Totals	2401	96.039	--	--	4.598	95.942	0.03995	2401

Slump, mm - 80

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2431

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.573

Comp. Str. @ 28 d, MPa - 31.0, 30.2

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.747
Absorption, % -	0.50	0.43
Fineness Modulus -	2.540	—
Total Water Used - (excess water in aggregates plus extra required)	7.103	
Extra alkali used (NaOH) - (0.94 1.25)	49.6	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R4 - 1 & 2

DATE: 87-04-02

TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12,400	--	--	--	12.400	0.00394	312
Water	180	7,200	--	--	--	6.862	0.00686	173
Sand	746	29.840	29.691	33.219	3.528	29.840	0.01131	750
C.A. 20-14 mm	391,333	15.653	15.534	47.968	1.008	46.959	0.01697	1181
14-10 mm	391,333	15.653	15.534					
10- 5 mm	391,333	15.653	15.534					
Air	1.5%	1.5%	--	--	--	1.7%	0.00068	1.7%
Totals	2,410	96.40	--	--	4.536	96.061	0.03976	2416

Slump, mm - 60

Air Content, % - 1.7

Unit Weight, kg/m^3 - 2444

Workability - Fair

Concrete Temperature, °C - 22

W/C - 0.553

Comp. Str. @ 28 d, MPa - 33.0, 32.3

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.767
Absorption, %	-	0.50	0.76
Fineness Modulus	-	2.540	--
Total Water Used (excess water in aggregates plus extra required)	-	6.862	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R4 - 3 & 4

DATE: 87-04-02

TIME: 15:00

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	180	7.200	--	--	--	6.890	0.00689	174
Sand	746	29.840	29.691	33,386	3.546	29.840	0.01131	752
C.A. 20-14 mm	391,333	15.653	15.534					
14-10 mm	391,333	15.653	15.534	47,845	0.886	46.959	0.01697	1184
10- 5 mm	391,333	15.653	15.534					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2410	96.400	--	--	4.432	96.089	0.03967	2423

Slump, mm - 80

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2428

Workability - Fair

Concrete Temperature, °C - 20

W/C - 0.556

Comp. Str. @ 28 d, MPa - 32.7, 32.7

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2,638	2,767
Absorption, %	-	0.50	0.76
Fineness Modulus	-	2,540	--
Total Water Used (excess water in aggregates plus extra required)	-	6.890	
Extra alkali used (NaOH) - (0.94% - 1.25%)	-	49,6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R5 - 1 & 2

DATE: April 3, 1987

TIME: 0930

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/ 0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	180	7.200	--	--	--	6.767	0.00677	171
Sand	746	29.840	29.691	33.361	3.791	29.840	0.01131	754
C.A. 20-14 mm	384	15.360	15.297					
14-10 mm	384	15.360	15.297	46.817	0.737	46.080	0.01697	1164
10- 5 mm	384	15.360	15.297					
Air	1.5%	1.5%	--	--	--	1.5%	0.00059	1.5%
Totals	2388	95.520	--	--	4.528	95.087	0.03958	2402

Slump, mm - 70
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2431
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.546
Comp. Str. @ 28 d, MPa - 33.5, 32.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.716
Absorption, % -	0.50	0.41
Fineness Modulus -	2.540	—
Total Water Used - (excess water in aggregates plus extra required)	6.767	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R5 - 3 & 4

DATE: 87/04/03

TIME: 1215

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	313
Water	180	7.200	—	—	—	6.826	0.00683	171
Sand	746	29.840	29.691	33.295	3.455	29.840	0.01131	754
C.A. 20-14 mm	384	15.360	15.297					
14-10 mm	384	15.360	15.297	47.033	0.953	46.080	0.01697	1164
10- 5 mm	384	15.360	15.297					
Air			—	—	—	1.5%	0.00059	1.5%
Totals	2388	95.520	—	—	4.408	95.176	0.03958	2402

Slump, mm - 70

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2438

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.546

COmp. Str. @ 28 d, Mpa - 29.5, 32.7

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.716
Absorption, %	-	0.50	0.41
Fineness Modulus	-	2.540	—
Total Water Used (excess water in aggregates plus extra required)	-	6.826	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R6 - 1 & 2

DATE: 870406

TIME: 0945

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	175	7.000	—	—	—	6.853	0.00685	172
Sand	751	30.040	29.890	34.146	4.256	30.040	0.01139	754
C.A. 20-14 mm	383.333	15.333	15.201					
14-10 mm	383.333	15.333	15.201	46.822	0.823	45.999	0.01709	1155
10- 5 mm	383.333	15.333	15.201					
Air	1.5%	1.5%	—	—	—	1.4%	0.00056	1.4%
Totals	2386	95.439	—	—	5.079	95.292	0.03482	2392

Slump, mm - 70

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2421

Workability - Good

Concrete Temperature, °C - 21

W/C - 0.553

Comp. Str. @ 28 k, MPa - 37.4, 37.3

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.692
Absorption, %	-	0.50	0.86
Fineness Modulus	-	2.540	—
Total Water Used (excess water in aggregates plus extra required)	-	6.853	
Extra alkali used (NaOH)	-	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R6 - 3 & 4

DATE: 870406

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	175	7.000	—	—	—	6.865	0.00686	172
Sand	751	30.040	29.890	33.645	3.755	30.040	0.01139	754
C.A. 20-14 mm	383.333	15.333	15.201					
14-10 mm	383.333	15.333	15.201	46.892	0.893	45.999	0.01709	1155
10- 5 mm	383.333	15.333	15.201					
Air	1.5%	1.5%	—	—	—	1.4%	0.00056	1.4%
Totals	2386	95.439	—	—	4.648	95.304	0.03984	2392

Slump, mm - 70

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2415

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.554

Comp. Str. @ 28 d, MPa - 34.0, 33.4

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.692
Absorption, %	-	0.50	0.86
Fineness Modulus	-	2.540	—
Total Water Used (excess water in aggregates plus extra required)	-	6.865	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R7 - 1 & 2

DATE: 870407

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	310
Water	175	7.000	—	--	—	7.121	0.00712	178
Sand	751	30.040	29.890	33.427	3.387	30.040	0.01139	752
C.A. 20-14 mm	384.667	15.387	15.312					
14-10 mm	384.667	15.387	15.312	47.040	1.104	46.161	0.01708	1156
10- 5 mm	384.667	15.387	15.312					
Air	1.5%	1.5%	—	--	—	1.0%	0.00040	1.0%
Totals	2390	95.601	--	--	4.491	95.722	0.03993	2396

Slump, mm - 70

Air Content, % - 1.0

Unit Weight, kg/m^3 - 2425

Workability - Fair-Good

Concrete Temperature, °C - 20

W/C - 0.574

Comp. Str. @ 28 d, MPa - 33.6, 34.1

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.702
Absorption, % -	0.50	0.49
Fineness Modulus -	2.540	—
Total Water Used (excess water in aggregates plus extra required) -	7.121	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R7 - 3 & 4

DATE: 870407

TIME: 1400

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	310
Water	175	7.000	—	--	—	7.091	0.00709	177
Sand	751	30.040	29.890	33.934	3.894	30.040	0.01139	750
C.A. 20-14 mm	384.667	15.387	15.312					
14-10 mm	384.667	15.387	15.312	47.154	0.993	46.161	0.01708	1152
10- 5 mm	384.667	15.387	15.312					
Air	1.5%	1.5%	—	--	—	1.4%	0.00056	1.4%
Totals	2390	95.601	—	--	4.887	95.692	0.04006	2389

Slump, mm - 60
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2393
Workability - Fair
Concrete Temperature, °C - 20
W/C - 0.572
Comp. Str. @ 28 d, MPa - 28.5, 27.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.702
Absorption, % -	0.50	0.49
Fineness Modulus -	2.540	—
Total Water Used - (excess water in aggregates plus extra required)	7.091	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R8 - 1 & 2

DATE: 870408

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.196	0.00720	179
Sand	751	30.040	29.890	33.933	3.533	30.040	0.01139	748
C.A. 20-14 mm	384	15.360	15.288					
14-10 mm	384	15.360	15.288	47.468	1.388	46.080	0.01708	1147
10- 5 mm	384	15.360	15.288					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2388	95.520	--	--	4.921	95.716	0.04017	2383

Slump, mm - 60

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2418

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.580

Comp. Str. @ 28 d, MPa - 32.6, 32.8

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.697
Absorption, %	-	0.50	0.47
Fineness Modulus	-	2.516	--
Total Water Used (excess water in aggregates plus extra required)	-	7.196	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R8 - 3 & 4

DATE: 870409

TIME: 1600

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	310
Water	175	7.000	—	—	—	6.959	0.00696	174
Sand	751	30.040	29.890	33.856	3.966	30.040	0.01139	750
C.A. 20-14 mm	384	15.360	15.288					
14-10 mm	384	15.360	15.288	46.981	0.901	46.080	0.01709	1150
10- 5 mm	384	15.360	15.288					
Air	1.5%	1.5%	—	—	—	1.7%	0.00068	1.7%
Totals	2388	95.520	—	—	4.867	95.479	0.04006	2384

Slump, mm - 80
Air Content, % - 1.7
Unit Weight, kg/m^3 - 2423
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.561
Comp. Str. @ 28 d, MPa - 33.1, 33.0

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.697
Absorption, %	-	0.50	0.47
Fineness Modulus	-	2.516	—
Total Water Used (excess water in aggregates plus extra required)	-	6.959	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R9 - 1 & 2

DATE: 870409

TIME: 0915

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.949	0.00695	174
Sand	751	30.040	29.890	33.971	3.931	30.040	0.01139	754
C.A. 20-14 mm	383	15.320	15.200					
14-10 mm	383	15.320	15.200	46.765	0.805	45.960	0.01709	1153
10- 5 mm	383	15.320	15.200					
Air	1.5%	1.5%	--	--	--	1.2%	0.00048	1.2%
Totals	2385	95.400	--	--	4.736	95.349	0.03985	2392

Slump, mm - 80

Air Content, % - 1.2

Unit Weight, kg/m^3 - 2428

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.560

Comp. Str @ 28 d, MPa - 33.1, 34.5

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.690
Absorption, %	-	0.50	0.78
Fineness Modulus	-	2.516	--
Total Water Used (excess water in aggregates plus extra required)	-	6.949	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R9 - 3 & 4

DATE: 870409

TIME: 1415

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	312
Water	175	7.000	—	—	—	6.734	0.00673	170
Sand	751	30.040	29.890	33.736	3.696	30.040	0.01139	756
C.A. 20-14 mm	383	15.320	15.200					
14-10 mm	383	15.320	15.200	46.765	0.805	45.960	0.01709	1157
10- 5 mm	383	15.320	15.200					
Air	1.5%	1.5%	—	—	—	1.4 %	0.00056	1.4%
Totals	2385	95.400	--	—	4.501	95.134	0.03971	2395

Slump, mm - 70

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2416

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.543

Comp. Str. @ 28 d, MPa - 34.2, 34.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.690
Absorption, % -	0.50	0.78
Fineness Modulus -	2.540	--
Total Water Used - (excess water in aggregates plus extra required)	6.734	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R10 - 1 & 2
DATE: 87 04 10
TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	308
Water	175	7.000	--	--	--	7.100	0.00710	177
Sand	751	30.040	29.890	33.843	3.803	30.040	0.01139	747
C.A. 20-14 mm	374	14.960	14.849					
14-10 mm	374	14.960	14.849	45.882	1.002	44.880	0.01708	1116
10- 5 mm	374	14.960	14.849					
Air	1.5%	1.5%	--	--	--	1.7	0.00068	1.7
Totals	2358	94.320	--	--	4.805	94.420	0.04019	2348

Slump, mm - 70
Air Content, % - 1.7
Unit Weight, kg/m^3 - 2363
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.572
Compressive Strength @ 28 d, MPa - 30.0, 31.2

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.627
Absorption, %	-	0.50	0.74
Fineness Modulus	-	2.516	
Total Water Used (excess water in aggregates plus extra required)	-	7.100	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R10 - 3 & 4
DATE: 870410
TIME: 1145

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	310
Water	175	7.000	—	—	—	6.930	0.00693	173
Sand	751	30.040	29.890	33.684	3.644	30.040	0.01139	751
C.A. 20-14 mm	374	14.960	14.849					
14-10 mm	374	14.960	14.849	45.682	1.102	44.880	0.01708	1123
10- 5 mm	374	14.960	14.849					
Air	1.5%	1.5%	—	—	—	1.6%	0.00064	1.6%
Totals	2358	94.320	—	—	4.746	94.250	0.03998	2357

Slump, mm - 70
Air Content, % - 1.6
Unit Weight, kg/m^3 - 2385
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.559
Comp. Str. @ 28 d, MPa - 31.1, 30.8

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.627
Absorption, %	-	0.50	0.74
Fineness Modulus	-	2.516	—
Total Water Used (excess water in aggregates plus extra required)	-	6.930	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R11 - 1 & 2

DATE: 87 04 13

TIME: 0930

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	307
Water	175	7.000	—	--	—	7.467	0.00747	185
Sand	751	30.040	29.890	33.784	3.744	30.040	0.01139	743
C.A. 20-14 mm	371	14.840	14.824					
14-10 mm	371	14.840	14.824	45.683	1.163	44.520	0.01709	1101
10- 5 mm	371	14.840	14.824					
Air	1.5%	1.5%	—	--	--	1.3%	0.00052	1.3%
Totals	2349	93.960	--	--	4.907	94.427	0.04042	2336

Slump, mm - 80
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2381
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.602
Compressive Strength @ 28 d, MPa - 35.1, 34.6

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.605
Absorption, % -	0.50	0.11
Fineness Modulus -	2.516	--
Total Water Used - (excess water in aggregates plus extra required)	7.467	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R11 - 3 & 4

DATE: 870413

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	309
Water	175	7.000	—	—	—	7.197	0.00720	179
Sand	751	30.040	29.890	34.214	4.174	30.040	0.01139	748
C.A. 20-14 mm	371	14.840	14.824					
14-10 mm	371	14.840	14.824	45.679	1.159	44.520	0.01709	1109
10- 5 mm	371	14.840	14.824					
Air	1.5%	1.5%	—	—	—	1.3%	0.00052	1.3%
Totals	2349	93.960	—	—	5.333	94.157	0.04014	2345

Slump, mm - 80
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2380
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.580
Comp. Str. @ 28 d, MPa - 32.5, 32.5

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2,605
Absorption, % -	0.50	0.11
Fineness Modulus -	2.516	—
Total Water Used - (excess water in aggregates plus extra required)	7.197	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R12 - 1 &2

DATE: 870414

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ $0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	310
Water	175	7.000	—	--	—	6.929	0.00693	173
Sand	751	30.040	29.890	33.942	3.902	30.040	0.01139	752
C.A. 20-14 mm	361	14.440	14.040					
14-10 mm	361	14.440	14.040	43.953	0.633	43.320	0.01708	1085
10- 5 mm	361	14.440	14.040					
Air	1.5%	1.5%	—	--	—	1.5%	0.00060	1.5%
Totals	2319	92.760	--	--	4.535	92.689	0.03994	2320

Slump, mm - 80

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2338

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.559

Comp. Str. @ 28 d, MPa - 36.4, 36.2

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.536
Absorption, %	-	0.50	2.77
Fineness Modulus	-	2.516	—
Total Water Used (excess water in aggregates plus extra required)	-	6.929	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R12 - 3 & 4
DATE: 870414
TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	312
Water	175	7.000	—	--	—	6.824	0.00682	172
Sand	751	30.040	29.890	33.872	3.832	30.040	0.01139	756
C.A. 20-14 mm	361	14.440	14.040					
14-10 mm	361	14.440	14.040	44.186	0.866	43.320	0.01708	1090
10- 5 mm	361	14.440	14.040					
Air	1.5%	1.5%	—	--	—	1.3%	0.00052	1.3%
Totals	2319	92.760	—	--	4.698	92.584	0.03975	2330

Slump, mm - 90
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2343
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.550
Comp. Str. @ 28 d, MPa - 35.1, 34.1

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.536
Absorption, %	-	0.50	2.77
Fineness Modulus	-	2.516	—
Total Water Used (excess water in aggregates plus extra required)	-	6.824	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R13 - 1 & 2

DATE: 87 04 15

TIME: 0945

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	6.949	0.00695	173
Sand	751	30.040	29.890	33.974	3.934	30.040	0.01139	749
C.A. 20-14 mm	374	14.960	14.887					
14-10 mm	374	14.960	14.887	45.866	0.986	44.880	0.01708	1119
10- 5 mm	374	14.960	14.887					
Air	1.5%	1.5%	--	--	--	1.9%	0.00076	1.9%
Totals	2358	94.320	--	--	4.920	94.269	0.04012	2350

Slump, mm - 80
Air Content, % - 1.9
Unit Weight, kg/m^3 - 2370
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.560
Comp. Str. @ 28 d, MPa - 34.9, 36.0

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.627
Absorption, % -	0.50	0.49
Fineness Modulus -	2.516	--
Total Water Used - (excess water in aggregates plus extra required)	6.949	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R13 - 3 & 4

DATE: 87 04 15

TIME: 1400

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	175	7.000	--	--	--	6.667	0.00667	168
Sand	751	30.040	29.890	33.922	3.882	30.040	0.01139	756
C.A. 20-14 mm	374	14.960	14.887					
14-10 mm	374	14.960	14.887	45.606	0.726	44.880	0.01708	1130
10- 5 mm	374	14.960	14.887					
Air	1.5%	1.5%	--	--	--	1.6%	0.00064	1.6%
Totals	2358	94.320	--	--	4.608	93.987	0.03972	2366

Slump, mm - 70

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2393

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.538

Comp. Str. @ 28 d, MPa - 32.0, 33.4

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.627
Absorption, % -	0.50	0.49
Fineness Modulus -	2.516	--
Total Water Used - (excess water in aggregates plus extra required)	6.667	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R14 - 1 & 2

DATE: 87 04 16

TIME: 0900

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.845	0.00684	172
Sand	751	30.040	29.890	33.851	3.811	30.040	0.01139	753
C.A. 20-14 mm	364.67	14.587	14.227					
14-10 mm	364.67	14.587	14.227	44.545	0.784	43.761	0.01709	1097
10- 5 mm	364.67	14.587	14.227					
Air	1.5%	1.5%	--	--	--	1.6%	0.00064	1.6%
Totals	2330	93.201	--	--	4.595	93.046	0.03990	2333

Slump, mm - 70

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2348

Workability - Good

Concrete Temperature, °C - 21

W/C - 0.552

Comp. Str. @ 28 d, MPa - 34.8, 36.3

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.560
Absorption, % -	0.50	2.47
Fineness Modulus -	2.516	--
Total Water Used - (excess water in aggregates plus extra required)	6.845	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R14 - 3 & 4

DATE: 87 04 16

TIME: 1130

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	311
Water	175	7.000	—	--	—	6.943	0.00694	174
Sand	751	30.040	29.890	34.150	4.110	30.040	0.01139	754
C.A. 20-14 mm	364.67	14.587	14.227					
14-10 mm	364.67	14.587	14.227	44.550	0.789	43.761	0.01709	1098
10- 5 mm	364.67	14.587	14.227					
Air	1.5%	1.5%	--	--	--	1.2%	0.00049	1.2%
Totals	2330	93.201	--	--	4.899	93.144	0.03984	2337

Slump, mm - 80

Air Content, % - 1.2

Unit Weight, kg/m^3 - 2341

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.560

Comp. Str. @ 28 d, MPa - 33.4, 33.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.560
Absorption, % -	0.50	2.47
Fineness Modulus -	2.516	--
Total Water Used - (excess water in aggregates plus extra required)	6.943	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R15 - 1 & 2

DATE: 87 04 20

TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.055	0.00706	176
Sand	751	30.040	29.890	33.657	3.617	30.040	0.01139	750
C.A. 20-14 mm	378.333	15.133	15.029					
14-10 mm	378.333	15.133	15.029	46.279	0.880	45.399	0.01709	1133
10- 5 mm	378.333	15.133	15.029					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2371	94.839	--	--	4.497	94.894	0.04008	2368

Slump, mm - 60

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2403

Workability - Good

Concrete Temperature, °C - 23

W/C - 0.569

Comp. Str. @ 28 d, MPa - 33.4, 33.1

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.657
Absorption, %	-	0.50	0.69
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	7.055	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R15 - 3 & 4

DATE: 87 04 20

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.086	0.00709	177
Sand	751	30.040	29.890	33.852	3.812	30.040	0.01139	749
C.A. 20-14 mm	378.333	15.133	15.029					
14-10 mm	378.333	15.133	15.029	46.396	0.997	45.399	0.01709	1132
10- 5 mm	378.333	15.133	15.029					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2371	94.839	--	--	4.809	94.925	0.04011	2367

Slump, mm - 90
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2385
Workability - Good
Concrete Temperature, °C - 24
W/C - 0.573
Comp. Str. @ 28 d, MPa - 29.3, 28.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.657
Absorption, % -	0.50	0.69
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	7.086	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R16 - 1 & 2

DATE: 87 04 21

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.167	0.00717	179
Sand	751	30.040	29.890	33.806	3.766	30.040	0.01139	749
C.A. 20-14 mm	408.667	16.347	16.293					
14-10 mm	408.667	16.347	16.293	49.992	1.113	49.041	0.01708	1223
10- 5 mm	408.667	16.347	16.293					
Air	1.5%	1.5%	--	--	--	1.3%	0.00052	1.3%
Totals	2462	98.481	--	--	4.879	98.648	0.04010	2460

Slump, mm - 70
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2480
Workability - Good
Concrete Temperature, °C - 24
W/C - 0.578
Comp. Str. @ 28 d, MPa - 32.5, 32.3

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.871
Absorption, %	-	0.50	0.33
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	7.167	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R16 - 3 & 4

DATE: 87 04 21

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	175	7.000	—	—	—	6.866	0.00687	172
Sand	751	30.040	29.890	33.706	3.666	30.040	0.01139	752
C.A. 20-14 mm	408.667	16.347	16.293					
14-10 mm	408.667	16.347	16.293	50.100	1.059	49.041	0.01708	1228
10- 5 mm	408.667	16.347	16.293					
Air	1.5%	1.5%	—	—	—	1.6%	0.00064	1.6%
Totals	2462	98.481	--	--	4.725	98.347	0.03992	2463

Slump, mm - 90
Air Content, % - 1.6
Unit Weight, kg/m^3 - 2491
Workability - Good
Concrete Temperature, °C - 22
W/C - 0.554
Comp. Str. @ 28 d, MPa - 27.2, 27.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.871
Absorption, % -	0.50	0.33
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.866	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R17 - 1 & 2

DATE: 87 04 22

TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	175	7.000	--	--	--	6.809	0.00681	171
Sand	751	30.040	29.890	33.865	3.825	30.040	0.01139	755
C.A. 20-14 mm	368	14.720	14.604					
14-10 mm	368	14.720	14.604	45.159	0.999	44.160	0.01709	1110
10- 5 mm	368	14.720	14.604					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2340	93.600	--	--	4.824	93.409	0.03979	2348

Slump, mm - 80

Air Content, % - 1.4

Unit Weight, kg/m^3 - 2376

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.549

Comp. Str. @ 28 d, MPa - 36.6, 36.6

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.584
Absorption, % -	0.50	0.79
Fineness Modulus -	2.563	--
Total Water Used (excess water in aggregates plus extra required) -	6.809	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R17 - 3 & 4

DATE: 87 04 22

TIME: 1445

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	175	7.000	—	--	—	6.692	0.00669	168
Sand	751	30.040	29.890	33.833	3.793	30.040	0.01139	756
C.A. 20-14 mm	368	14.720	14.604					
14-10 mm	368	14.720	14.604	45.375	1.215	44.160	0.01709	1112
10- 5 mm	368	14.720	14.604					
Air	1.5%	1.5%	—	--	--	1.5%	0.00060	1.5%
Totals	2340	93.600	--	--	5.008	93.292	0.03971	2348

Slump, mm - 80

Air Content, % - 1.5%

Unit Weight, kg/m^3 - 2378

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.540

Comp. Str. @ 28 d, MPa - 35.1, 34.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.584
Absorption, % -	0.50	0.79
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.692	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R18 - 1 & 2

DATE: 87 04 23

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m³	kg/0.04 m³ (A)	kg	kg (B)	kg (A-B)	kg	m³	kg/m³
Cement	310	12.400	--	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.829	0.00683	172
Sand	751	30.040	29.890	33.930	3.890	30.040	0.01139	755
C.A. 20-14 mm	372.667	14.907	14.819					
14-10 mm	372.667	14.907	14.819	45.557	0.836	44.721	0.01709	1123
10- 5 mm	372.667	14.907	14.819					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2354	94.161	--	--	4.726	93.990	0.03981	2361

Slump, mm - 80
Air Content, % - 1.4
Unit Weight, kg/m³ - 2373
Workability - Good
Concrete Temperature, °C - 22
W/C - 0.551
Comp. Str. @ 28 d, MPa - 35.5, 34.1

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.617
Absorption, %	-	0.50	0.59
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	6.829	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R18 - 3 & 4

DATE: 87 04 23

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	313
Water	175	7.000	—	—	—	6.725	0.00672	170
Sand	751	30.040	29.890	34.008	3.968	30.040	0.01139	757
C.A. 20-14 mm	372.667	14.907	14.819					
14-10 mm	372.667	14.907	14.819	45.894	1.173	44.721	0.01709	1128
10- 5 mm	372.667	14.907	14.819					
Air	1.5%	1.5%	—	--	—	1.3%	0.00052	1.3%
Totals	2354	94.161	--	--	5.141	93.886	0.03966	2368

Slump, mm - 80

Air Content, % - 1.3

Unit Weight, kg/m^3 - 2400

Workability - Good

Concrete Temperature, °C - 21

W/C - 0.542

Comp. Str. @ 28 d, MPa - 33.1, 32.5

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.617
Absorption, % -	0.50	0.59
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.725	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R19 - 1 & 2
DATE: 87 04 24
TIME: 0915

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04 m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	175	7.000	—	--	—	6.682	0.00668	168
Sand	751	30.040	29.890	33.787	3.747	30.040	0.01139	757
C.A. 20-14 mm	372.667	14.907	14.794					
14-10 mm	372.667	14.907	14.794	45.728	1.007	44.721	0.01709	1126
10- 5 mm	372.667	14.907	14.794					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2354	94.161	--	--	4.754	93.843	0.03970	2363

Slump, mm - 70
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2395
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.539
Comp. Str. @ 28 d, MPa - 35.2, 34.3

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.617
Absorption, %	-	0.50	0.76
Fineness Modulus	-	2.563	
Total Water Used (excess water in aggregates plus extra required)	-	6.682	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R19 - 3 & 4

DATE: 87 04 24

TIME: 1130

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	313
Water	175	7.000	—	--	—	6.640	0.00664	168
Sand	751	30.040	29.890	33.936	3.896	30.040	0.01139	759
C.A. 20-14 mm	372.667	14.907	14.794					
14-10 mm	372.667	14.907	14.794	45.871	1.15	44.721	0.01709	1130
10- 5 mm	372.667	14.907	14.794					
Air	1.5%	1.5%	—	--	--	1.3%	0.00051	1.3%
Totals	2354	94.161	--	--	5.046	93.801	0.03957	2370

Slump, mm - 80
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2383
Workability - V. Good
Concrete Temperature, °C - 20
W/C - 0.536
Comp. Str. @ 28 d, MPa - 34.1, 34.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.617
Absorption, % -	0.50	0.76
Fineness Modulus -	2.563	
Total Water Used - (excess water in aggregates plus extra required)	6.640	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R20 - 1 & 2

DATE: 87 04 27

TIME: 0945

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	175	7.000	—	--	—	6.796	0.00680	171
Sand	751	30.040	29.890	33.684	3.644	30.040	0.01139	757
C.A. 20-14 mm	406.667	16.267	16.178					
14-10 mm	406.667	16.267	16.178	49.836	1.035	48.801	0.01708	1230
10- 5 mm	406.667	16.267	16.178					
Air	1.5%	1.5%	--	--		1.2%	0.00048	1.2%
Totals	2456	98.241	--	--	4.679	98.037	0.03969	2470

Slump, mm - 80

Air Content, % - 1.2

Unit Weight, kg/m^3 - 2490

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.548

Comp. Str. @ 28 d, MPa - 34.9, 34.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.857
Absorption, % -	0.50	0.55
Fineness Modulus -	2.563	
Total Water Used - (excess water in aggregates plus extra required)	6.796	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R20 - 3 & 4

DATE: 87 04 27

TIME: 1430

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	313
Water	175	7.000	—	--	—	6.656	0.00666	168
Sand	751	30.040	29.890	33.689	3.649	30.040	0.01139	757
C.A. 20-14 mm	406.667	16.267	16.178					
14-10 mm	406.667	16.267	16.178	49.790	0.989	48.801	0.01708	1230
10- 5 mm	406.667	16.267	16.178					
Air	1.5%	1.5%	—	--	--		0.00060	
Totals	2456	98.241	--	--	4.638	97.897	0.03966	2468

Slump, mm - 70

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2466

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.537

Comp. Str. @ 28 d, MPa - 31.8, 32.6

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.857
Absorption, %	-	0.50	0.55
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	6.656	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R21 - 1 & 2

DATE: 87 04 28

TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	175	7.000	--	--	--	6.876	0.00688	173
Sand	751	30.040	29.890	33.616	3.576	30.040	0.01139	756
C.A. 20-14 mm	396	15.840	15.748					
14-10 mm	396	15.840	15.748	48.444	0.924	47.520	0.01709	1196
10- 5 mm	396	15.840	15.748					
Air	1.5%	1.5%	--	--	--	1.1%	0.00044	1.1%
Totals	2424	96.96	--	--	4.500	96.836	0.03974	2436

Slump, mm - 80
Air Content, % - 1.1
Unit Weight, kg/m^3 - 2458
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.554
Compressive Strength @ 28 d, MPa - 35.6, 34.5

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.780
Absorption, %	-	0.50	0.58
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	6.876	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R21 - 3 & 4

DATE: 87 04 28

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.798	0.00680	171
Sand	751	30.040	29.890	34.076	4.036	30.040	0.01139	754
C.A. 20-14 mm	396	15.840	15.748					
14-10 mm	396	15.840	15.748	48.255	0.735	47.520	0.01709	1192
10- 5 mm	396	15.840	15.748					
Air	1.5%	1.5%	--	--	--	1.6%	0.00064	1.6%
Totals	2424	96.96	--	--	4.771	96.758	0.03986	2428

Slump, mm - 80

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2443

Workability - Good

Concrete Temperature, °C - 22

W/C - 0.548

Compressive Strength @ 28 d, MPa - 31.1, 30.1

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.780
Absorption, %	-	0.50	0.58
Fineness Modulus	-	2.563	--
Total Water Used (excess water in aggregates plus extra required)	-	6.798	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R22 - 1 & 2

DATE: 87 04 29

TIME: 0930

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	175	7.000	--	--	--	6.731	0.00673	170
Sand	751	30.040	29.890	33.630	3.590	30.040	0.01139	756
C.A. 20-14 mm	383.333	15.333	15.255					
14-10 mm	383.333	15.333	15.255	46.965	0.966	45.999	0.01709	1158
10- 5 mm	383.333	15.333	15.255					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2386	95.439	--	--	4.556	95.170	0.03971	2396

Slump, mm - 90
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2408
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.543
Compressive Strength @ 28 d, MPa - 35.5, 35.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.692
Absorption, % -	0.50	0.51
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.731	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R22 - 3 & 4

DATE: 87 04 29

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	175	7.000	—	--	—	6.772	0.00677	170
Sand	751	30.040	29.890	33.744	3.704	30.040	0.01139	755
C.A. 20-14 mm	383.333	15.333	15.255					
14-10 mm	383.333	15.333	15.255	47.001	1.002	45.999	0.01709	1156
10- 5 mm	383.333	15.333	15.255					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2386	95.439	--	--	4.706	95.221	0.03979	2393

Slump, mm - 90
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2410
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.546
Compressive Strength @ 28 d, MPa - 33.0, 32.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.692
Absorption, % -	0.50	0.51
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.772	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R23 - 1 & 2

DATE: 87 04 30

TIME: 1115

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.837	0.00684	171
Sand	751	30.040	29.890	33.783	3.743	30.040	0.01139	753
C.A. 20-14 mm	406	16.240	16.188					
14-10 mm	406	16.240	16.188	49.516	0.796	48.720	0.01709	1221
10- 5 mm	406	16.240	16.188					
Air	1.5%	1.5%	--	--	--	1.6%	0.00064	1.6%
Totals	2454	98.160	--	--	4.539	97.997	0.03990	2456

Slump, mm - 80
Air Content, % - 1.6
Unit Weight, kg/m^3 - 2483
Workability - V.Good
Concrete Temperature, °C - 20
W/C - 0.551
Compressive Strength @ 28 d, MPa - 34.0, 34.6

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.850
Absorption, % -	0.50	0.32
Fineness Modulus -	2.563	--
Total Water Used (excess water in aggregates plus extra required) -	6.837	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R23 - 3 &4

DATE: 87 04 30

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	175	7.000	—	--	—	6.744	0.00674	170
Sand	751	30.040	29.890	33.802	3.672	30.040	0.01139	756
C.A. 20-14 mm	406	16.240	16.188					
14-10 mm	406	16.240	16.188	49.675	0.955	48.720	0.01709	1225
10- 5 mm	406	16.240	16.188					
Air	1.5%	1.5%	—	--	—	1.5%	0.00060	1.5%
Totals	2454	98.16	--	--	4.627	97.904	0.03976	2463

Slump, mm - 90
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2490
Workability - V.Good
Concrete Temperature, °C - 20
W/C - 0.544
Compressive Strength @ 28 d, MPa - 32.3, 31.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.850
Absorption, % -	0.50	0.32
Fineness Modulus -	2.563	--
Total Water Used - (excess water in aggregates plus extra required)	6.744	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R24 - 1 & 2

DATE: 87 05 01

TIME: 0900

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	311
Water	175	7.000	—	--	--	6.993	0.00699	175
Sand	751	30.040	29.890	34.019	3.979	30.040	0.01139	752
C.A. 20-14 mm	388.333	15.533	15.444					
14-10 mm	388.333	15.533	15.444	47.590	0.991	46.599	0.01708	1167
10- 5 mm	388.333	15.533	15.444					
Air	1.5%	1.5%	--	--	--	1.3%	0.00052	1.3%
Totals	2401	96.039	--	--	4.970	96.032	0.03992	2405

Slump, mm - 70

Air Content, % - 1.3

Unit Weight, kg/m^3 - 2430

Workability - Fair

Concrete Temperature, °C - 19

W/C - 0.564

Comp. Str. @ 28 d, MPa - 31.8, 30.7

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.728
Absorption, %	-	0.50	0.57
Fineness Modulus	-	2.590	
Total Water Used (excess water in aggregates plus extra required)	-	6.993	
Extra alkali used (NaOH)	-	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R24 - 3 & 4
DATE: 87 05 01
TIME: 1130

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	311
Water	175	7.000	—	--	--	6.939	0.00694	174
Sand	751	30.040	29.890	33.663	3.623	30.040	0.01139	753
C.A. 20-14 mm	388.333	15.533	15.444					
14-10 mm	388.333	15.533	15.444	47.585	0.986	46.599	0.01708	1168
10- 5 mm	388.333	15.533	15.444					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2401	96.039	—	--	4.609	95.978	0.03991	2406

Slump, mm - 80
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2415
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.560
Comp. Str. @ 28 d, MPa - 31.4, 27.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.728
Absorption, % -	0.50	0.57
Fineness Modulus -	2.590	
Total Water Used - (excess water in aggregates plus extra required)	6.939	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R25 - 1 & 2

DATE: 87 05 04

TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.137	0.00714	178
Sand	751	30.040	29.890	34.408	4.368	30.040	0.01139	749
C.A. 20-14 mm	384.667	15.387	15.324					
14-10 mm	384.667	15.387	15.324	47.320	1.159	46.161	0.01708	1151
10- 5 mm	384.667	15.387	15.324					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2390	95.601	--	--	5.527	95.738	0.04011	2387

Slump, mm - 70
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2425
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.576
Comp. Str. @ 28 d, MPa - 32.3, 31.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.702
Absorption, % -	0.50	0.41
Fineness Modulus -	2.590	--
Total Water Used - (excess water in aggregates plus extra required)	7.137	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: R25 - 3 & 4

DATE: 87 05 04

TIME: 1430

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	308
Water	175	7.000	—	--	—	7.200	0.00720	179
Sand	751	30.040	29.890	34.042	4.152	30.040	0.01139	747
C.A. 20-14 mm	384.667	15.387	15.324					
14-10 mm	384.667	15.387	15.324	47.416	1.344	46.161	0.01708	1148
10- 5 mm	384.667	15.387	15.324					
Air	1.5%	1.5%	—	--	—	1.5%	0.00060	1.5%
Totals	2390	95.601	--	--	5.496	95.801	0.04021	2382

Slump, mm - 90

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2428

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.581

Comp. Str. @ 28 d, MPa - 30.0, 29.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.702
Absorption, % -	0.50	0.41
Fineness Modulus -	2.590	
Total Water Used - (excess water in aggregates plus extra required)	7.200	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR1 - 1 & 2
DATE: 87 05 05
TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	175	7.000	--	--	--	6.772	0.00677	170
Sand	751	30.040	29.890	33.615	3.725	30.040	0.01139	755
C.A. 20-14 mm	381.667	15.267	15.195					
14-10 mm	381.667	15.267	15.195	46.788	1.203	45.801	0.01709	1151
10- 5 mm	381.667	15.267	15.195					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2381	95.241	--	--	4.928	95.013	0.03979	2388

Slump, mm - 80
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2418
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.546
Comp. Str. @ 28 d, MPa - 32.2, 33.3

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.680
Absorption, % -	0.50	0.47
Fineness Modulus -	2.590	--
Total Water Used (excess water in aggregates plus extra required) -	6.772	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR1 - 3 & 4

DATE: 87 05 07

TIME: 1430

Material	Design Mix Proportions (SSD Agg.) kg/m^3	kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	311
Water	175	7.000	—	--	—	6.753	0.00675	170
Sand	751	30.040	29.890	33.880	3.840	30.040	0.01139	754
C.A. 20-14 mm	381.667	15.267	15.195					
14-10 mm	381.667	15.267	15.195	46.800	0.999	45.801	0.01708	1150
10- 5 mm	381.667	15.267	15.195					
Air	1.5%	1.5%	--	--	--	1.7%	0.00068	1.7%
Totals	2381	95.241	--	—	4.839	94.994	0.03984	2385

Slump, mm - 80

Air Content, % - 1.7

Unit Weight, kg/m^3 - 2421

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.544

Comp. Str. @ 28 d, MPa - 32.9, 32.3

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.680
Absorption, %	-	0.50	0.47
Fineness Modulus	-	2.590	
Total Water Used (excess water in aggregates plus extra required)	-	6.753	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CG2 - 1 & 2

DATE: 87 05 06

TIME: 0930

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	311
Water	175	7.000	--	--	--	6.655	0.0066	167
Sand	751	30.040	29.890	33.822	3.782	30.040	0.01139	754
C.A. 20-14 mm	386	15.440	15.366					
14-10 mm	386	15.440	15.366	47.241	0.921	46.320	0.01709	1162
10- 5 mm	386	15.440	15.366					
Air	1.5%	1.5%	--	--	--	1.9%	0.00076	1.9%
Totals	2394	95.760	--	--	4.703	95.415	0.03984	2394

Slump, mm - 80
Air Content, % - 1.9
Unit Weight, kg/m^3 - 2425
Workability - Very Good
Concrete Temperature, °C - 21
W/C - 0.537
Comp. Str. @ 28 d, MPa - 33.0, 33.1

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.712
Absorption, % -	0.50	0.48
Fineness Modulus -	2.590	—
Total Water Used - (excess water in aggregates plus extra required)	6.655	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CG2 - 3 & 4
DATE: 87 05 14
TIME: 1615

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	314
Water	175	7.000	--	--	—	6.505	0.00650	165
Sand	751	30.040	29.890	34.406	4.366	30.040	0.01139	761
C.A. 20-14 mm	386	15.440	15.366					
14-10 mm	386	15.440	15.366	47.342	1.022	46.320	0.01708	1174
10- 5 mm	386	15.440	15.366					
Air	1.5%	1.5%	--	--	—		0.00055	
Totals	2394	95.760	—	--	5.388	95.265	0.03946	2414

Slump, mm - 90
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2432
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.525
Comp. Str. @ 28 d, MPa - 30.9, 30.4

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.712
Absorption, % -	0.50	0.48
Fineness Modulus -	2.590	--
Total Water Used -	6.505	
(excess water in aggregates plus extra required)		
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR3 - 1 & 2
DATE: 87 05 07
TIME: 0945

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	307
Water	175	7.000	--	--	--	7.305	0.00730	181
Sand	751	30.040	29.890	33.687	3.647	30.040	0.01139	744
C.A. 20-14 mm	384	15.360	15.340					
14-10 mm	384	15.360	15.340	47.658	1.578	46.080	0.01708	1141
10- 5 mm	384	15.360	15.340					
Air	1.5%	1.5%	--	--	--	1.7%	0.00069	1.7%
Totals	2388	95.520	--	--	5.225	95.825	0.04040	2373

Slump, mm - 80
Air Content, % - 1.7
Unit Weight, kg/m^3 - 2406
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.589
Comp. Str. @ 28 d, MPa - 37.9, 36.9

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.698
Absorption, %	-	0.50	0.15
Fineness Modulus	-	2.590	--
Total Water Used (excess water in aggregates plus extra required)	-	7.305	
Extra alkali used (NaOH)	-	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR3 - 3 & 4

DATE: 87 05 07

TIME: 1115

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	309
Water	175	7.000	--	--	--	7.105	0.00710	177
Sand	751	30.040	29.890	33.758	3.718	30.040	0.01139	749
C.A. 20-14 mm	384	15.360	15.340					
14-10 mm	384	15.360	15.340	47.494	1.414	46.080	0.01708	1149
10- 5 mm	384	15.360	15.340					
Air	1.5%	1.5%	--	--	--	1.5%	0.00060	1.5%
Totals	2388	95.520	--	--	5.132	95.625	0.04011	2384

Slump, mm - 70

Air Content, % - 1.5%

Unit Weight, kg/m^3 - 2426

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.573

Comp. Str. @ 28 d, MPa - 34.0, 37.3

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.698
Absorption, % -	0.50	0.15
Fineness Modulus -	2.590	—
Total Water Used - (excess water in aggregates plus extra required)	7.105	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR4 - 1 & 2

DATE: 870402

TIME: 1145

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/ 0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	317
Water	180	7.200	--	--	--	6.450	0.00645	166
Sand	746	29.840	29.697	33.385	3.545	29.840	0.01131	762
C.A. 20-14 mm	384.333	15.373	15.246					
14-10 mm	384.333	15.373	15.246	46.764	0.650	46.119	0.01696	1177
10- 5 mm	384.333	15.373	15.246					
Air	1.5%	1.5%	--	--	--	1.5%	0.00051	1.5%
Totals	2389	95.559	--	--	4.195	94.809	0.03917	2422

Slump, mm - 70

Air Content, % - 1.3

Unit Weight, kg/m^3 - 2436

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.520

Comp. Str. @ 28 d, MPa - 35.6, 37.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.719
Absorption, % -	0.50	0.83
Fineness Modulus -	2.540	--
Total Water Used - (excess water in aggregates plus extra required)	6.450	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: CR4 - 3 & 4

DATE: 870401

TIME: 1415

Material	Design Mix Proportions (SSD Agg.) kg/m³	Design Mix Proportions (SSD Agg.) kg/ 0.04 m³ (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m³	Actual Mix Proportions (SSD Agg.) kg/m³
Cement	310	12.400	--	--	--	12.400	0.00394	317
Water	180	7.200	--	--	--	6.288	0.00623	161
Sand	746	29.840	29.692	33.433	3.593	29.840	0.01131	763
C.A. 20-14 mm	384.333	15.373	15.246					
14-10 mm	384.333	15.373	15.246	46.722	0.603	46.119	0.01696	1180
10- 5 mm	384.333	15.373	15.246					
Air	1.5%	1.5%	--	--	--	1.7%	0.00066	1.7%
Totals	2389	95.559			4.196	94.647	0.03910	2421

Slump, mm - 80
Air Content, % - 1.7
Unit Weight, kg/m³ - 2436
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.507
Comp. Str. @ 28 d, MPa - 32.3, 31.8

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.719
Absorption, %	-	0.50	0.83
Fineness Modulus	-	2.540	—
Total Water Used (excess water in aggregates plus extra required)	-	6.288	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

Actual amount of water required lower than anticipated.
∴ cement content slightly higher than Limits (310±5)

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G1 - 1 & 2
DATE: 87 05 08
TIME: 1100

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	170	6.800	--	--	--	6.449	0.00645	163
Sand	757	30.280	30.129	34.030	3.750	30.280	0.01148	764
C.A. 20-14 mm	373	14.920	14.750					
14-10 mm	373	14.920	14.750	45.580	0.820	44.760	0.01720	1130
10- 5 mm	373	14.920	14.750					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2356	94.240	--	--	4.570	93.889	0.03962	2370

Slump, mm - 90
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2398
Workability - V.Good
Concrete Temperature, °C - 19
W/C - 0.520
Comp. Str. @ 28 d, MPa - 33.3, 33.3

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.602
Absorption, % -	0.50	1.14
Fineness Modulus -	2.590	
Total Water Used (excess water in aggregates plus extra required) -	6.449	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: Gl - 3 & 4

DATE: 87 05 11

TIME: 0940

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	313
Water	170	6.800	—	—	—	6.369	0.00637	161
Sand	757	30.280	30.129	33.93	3.650	30.280	0.01148	765
C.A. 20-14 mm	373	14.920	14.750					
14-10 mm	373	14.920	14.750	45.58	0.82	44.760	0.01720	1131
10- 5 mm	373	14.920	14.750					
Air	1.5%	1.5%	—	—	—	1.5%	0.00059	1.5%
Totals	2356	94.240	—	—	4.470	93.813	0.03958	2370

Slump, mm - 90
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2393
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.514
Comp. Str. @ 28 d, MPa - 31.8, 31.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.602
Absorption, % -	0.50	1.14
Fineness Modulus -	2.590	--
Total Water Used - (excess water in aggregates plus extra required)	6.369	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G2 - 1 & 2
DATE: 87 05 11
TIME: 1145

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	311
Water	170	6.800	—	—	—	6.540	0.00654	164
Sand	757	30.280	30.129	34.015	3.735	30.280	0.01148	760
C.A. 20-14 mm	381.333	15.253	15.070					
14-10 mm	381.333	15.253	15.070	46.672	0.913	45.759	0.0172	1149
10- 5 mm	381.333	15.253	15.070					
Air	1.5%	1.5%	—	--	—	1.7%	0.00068	1.7%
Totals	2381	95.239	—	--	4.648		0.03984	2384

Slump, mm - 90
Air Content, % - 1.7
Unit Weight, kg/m^3 - 2401
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.527
Comp. Str. @ 28 d, MPa - 32.6, 32.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.660
Absorption, % -	0.50	1.20
Fineness Modulus -	2.590	--
Total Water Used (excess water in aggregates plus extra required) -	6.540	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G2 - 3 & 4

DATE: 87 05 11

TIME: 1445

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	313
Water	165	6.600	—	--	—	6.339	0.00634	160
Sand	762	30.480	30.328	34.053	3.573	30.480	0.01155	769
C.A. 20-14 mm	384	15.360	15.176					
14-10 mm	384	15.360	15.176	47.037	0.957	46.080	0.01732	1162
10- 5 mm	384	15.360	15.176					
Air	1.5%	1.5%	--	--	—	1.2%	0.00048	1.2%
Totals	2389	95.560	--	--	4.530	95.299	0.03963	2404

Slump, mm - 80
Air Content, % - 1.2
Unit Weight, kg/m^3 - 2398
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.511
Comp. Str. @ 28 d, MPa - 31.5, 31.2

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.660
Absorption, % -	0.50	1.20
Fineness Modulus -	2.590	—
Total Water Used - (excess water in aggregates plus extra required)	6.339	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G3 - 1 & 2

DATE: 87 05 12

TIME: 0940

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	310
Water	165	6.600	--	--	--	6.537	0.00654	164
Sand	762	30.480	30.328	34.066	3.586	30.480	0.01155	762
C.A. 20-14 mm	383	15.320	15.107					
14-10 mm	383	15.320	15.107	46.879	0.919	45.960	0.01732	1149
10- 5 mm	383	15.320	15.107					
Air	1.5%	1.5%	--	--	--	1.6%	0.00064	1.6%
Totals	2386	95.440	--	--	4.505	95.377	0.03999	2385

Slump, mm - 70

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2405

Workability - Good

Concrete Temperature, °C - 21

W/C - 0.527

Comp. Str. @ 28 d, MPa - 30.7, 33.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.653
Absorption, % -	0.50	1.39
Fineness Modulus -	2.698	--
Total Water Used (excess water in aggregates plus extra required) -	6.537	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G3 - 3 & 4

DATE: 87 05 12

TIME: 1430

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	310
Water	165	6.600	—	—	—	6.577	0.00658	164
Sand	762	30.480	30.328	34.125	3.645	30.480	0.01155	761
C.A. 20-14 mm	383	15.320	15.107					
14-10 mm	383	15.320	15.107	46.899	0.939	45.960	0.01732	1148
10- 5 mm	383	15.320	15.107					
Air	1.5%	1.5%	—	—	—	1.6%	0.00064	1.6%
Totals	2386	95.440	—	—	4.584	95.417	0.04003	2383

Slump, mm - 80

Air Content, % - 1.6

Unit Weight, kg/m^3 - 2408

Workability - Good

Concrete Temperature, °C - 20

W/C - 0.530

Comp. Str. @ 28 d, MPa - 29.7, 30.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.653
Absorption, % -	0.50	1.39
Fineness Modulus -	2.698	--
Total Water Used - (excess water in aggregates plus extra required)	6.577	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G4- 1 & 2

DATE: 87 05 13

TIME: 1115

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	165	6.600	—	—	—	6.564	0.00656	165
Sand	762	30.480	30.328	34.288	3.808	30.480	0.01155	764
C.A. 20-14 mm	380.667	15.227	14.974					
14-10 mm	380.667	15.227	14.974	46.644	0.813	45.681	0.01732	1145
10- 5 mm	380.667	15.227	14.974					
Air	1.5%	1.5%	—	—	—		0.00052	
Totals	2379	95.161	—	—	4.621	95.125	0.03989	2385

Slump, mm - 90
Air Content, % - 1.3
Unit Weight, kg/m^3 - 2398
Workability - V.Good
Concrete Temperature, °C - 19
W/C - 0.529
Comp. Str. @ 28 d, MPa - 34.5, 33.8

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.637
Absorption, %	-	0.50	1.66
Fineness Modulus	-	2.698	—
Total Water Used (excess water in aggregates plus extra required)	-	6.564	
Extra alkali used (NaOH)	-	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G4 - 3 & 4

DATE: 87 05 13

TIME: 1415

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	311
Water	165	6.600	—	--	—	6.420	0.00642	161
Sand	762	30.480	30.328	34.17	3.690	30.480	0.01155	765
C.A. 20-14 mm	380.667	15.227	14.974					
14-10 mm	380.667	15.227	14.974	46.587	0.906	45.681	0.01732	1147
10- 5 mm	380.667	15.227	14.974					
Air	1.5%	1.5%	—	--	—	1.5%	0.00060	1.5%
Totals	2379	95.161	--	--	4.596	94.981	0.03983	2384

Slump, mm - 80

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2408

Workability - Good

Concrete Temperature, °C - 19

W/C - 0.518

Comp. Str. @ 28 d, MPa - 31.8, 31.8

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.637
Absorption, % -	0.50	1.66
Fineness Modulus -	2.698	—
Total Water Used - (excess water in aggregates plus extra required)	6.420	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G5 - 1 & 2
DATE: 87 05 14
TIME: 0930

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	--	12.400	0.00394	311
Water	165	6.600	--	--	—	6.479	0.00648	163
Sand	762	30.480	30.328	34.895	4.415	30.480	0.01155	765
C.A. 20-14 mm	384	15.360	15.176					
14-10 mm	384	15.360	15.176	47.053	0.973	46.080	0.01732	1156
10- 5 mm	384	15.360	15.176					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2389	95.560	—	--	5.388	95.439	0.03985	2395

Slump, mm - 80
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2413
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.522
Comp. Str. @ 28 d, MPa - 34.9, 35.9

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.660
Absorption, % -	0.50	1.20
Fineness Modulus -	2.698	—
Total Water Used - (excess water in aggregates plus extra required)	6.479	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G5 - 3 & 4

DATE: 87 05 14

TIME: 1145

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	165	6.600	—	—	—	6.438	0.00644	162
Sand	762	30.480	30.328	34.556	4.070	30.480	0.01155	765
C.A. 20-14 mm	384	15.360	15.176					
14-10 mm	384	15.360	15.176	47.026	0.946	46.080	0.01732	1156
10- 5 mm	384	15.360	15.176					
Air	1.5%	1.5%	—	—	—	1.5%	0.00060	1.5%
Totals	2389	95.560	—	—	5.032	95.398	0.03985	2394

Slump, mm - 80

Air Content, % - 1.5

Unit Weight, kg/m^3 - 2415

Workability - Good

Concrete Temperature, °C - 21

W/C - 0.519

Comp. Str. @ 28 d, MPa - 32.3, 31.4

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.660
Absorption, %	-	0.50	1.20
Fineness Modulus	-	2.698	—
Total Water Used (excess water in aggregates plus extra required)	-	6.438	
Extra alkali used (NaOH) (0.94% - 1.25%)	-	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G6 - 1 & 2

DATE: 87 05 15

TIME: 0925

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	311
Water	165	6.600	--	--	—	6.419	0.00642	161
Sand	762	30.480	30.328	34.436	3.956	30.480	0.01155	765
C.A. 20-14 mm	382.667	15.307	15.160					
14-10 mm	382.667	15.307	15.160	46.815	0.894	45.921	0.01732	1153
10- 5 mm	382.667	15.307	15.160					
Air	1.5%	1.5%	—	--	--	1.5%	0.00060	1.5%
Totals	2385	95.401	--	--	4.850	95.220	0.03983	2390

Slump, mm - 70
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2420
Workability - Good
Concrete Temperature, °C - 20
W/C - 0.518
Comp. Str. @ 28 d, MPa - 34.8, 34.0

		Fine Aggregate	Coarse Aggregate
Relative Density (SSD)	-	2.638	2.651
Absorption, %	-	0.50	0.96
Fineness Modulus	-	2.698	--
Total Water Used (excess water in aggregates plus extra required)	-	6.419	
Extra alkali used (NaOH)	-	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G6 - 3 & 4
DATE: 87 05 15
TIME: 1145

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg.(SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	—	—	12.400	0.00394	311
Water	165	6.600	—	—	—	6.461	0.00646	162
Sand	762	30.480	30.328	34.263	3.783	30.480	0.01155	764
C.A. 20-14 mm	382.667	15.307	15.160					
14-10 mm	382.667	15.307	15.160	46.871	0.950	45.921	0.01732	1151
10- 5 mm	382.667	15.307	15.160					
Air	1.5%	1.5%	—	—	—	1.6%	0.00064	1.6%
Totals	2385	95.401	—	—	4.733	95.262	0.03991	2388

Slump, mm - 70
Air Content, % - 1.6
Unit Weight, kg/m^3 - 2401
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.521
Comp. Str. @ 28 d, MPa - 31.6, 32.7

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2638	2.651
Absorption, % -	0.50	0.96
Fineness Modulus -	2.698	
Total Water Used - (excess water in aggregates plus extra required)	6.461	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G7 - 1 & 2

DATE: 87 05 19

TIME: 1000

Material	Design Mix Proportions (SSD Agg.) kg/m^3	Design Mix Proportions (SSD Agg.) kg/0.04 m^3 (A)	Weight of Dry Agg. kg	Weight of Saturated Agg. kg (B)	Weight of Excess Water in Agg. (SSD) kg (A-B)	Final Batch Weights (SSD Agg.) kg	Volume m^3	Actual Mix Proportions (SSD Agg.) kg/m^3
Cement	310	12.400	—	--	—	12.400	0.00394	312
Water	165	6.600	—	--	—	6.379	0.00638	160
Sand	762	30.480	30.328	34.240	3.760	30.480	0.01155	767
C.A. 20-14 mm	384.667	15.387	15.219					
14-10 mm	384.667	15.387	15.219	47.127	0.966	46.161	0.01733	1161
10- 5 mm	384.667	15.387	15.219					
Air	1.5%	1.5%	--	--	--	1.4%	0.00056	1.4%
Totals	2391	95.641	—	--	4.726	95.420	0.03976	2400

Slump, mm - 90
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2425
Workability - V.Good
Concrete Temperature, °C - 18
W/C - 0.514
Comp. Str. @ 28 d, MPa - 34.7, 35.2

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.663
Absorption, % -	0.50	1.09
Fineness Modulus -	2.698	
Total Water Used - (excess water in aggregates plus extra required)	6.379	
Extra alkali used (NaOH) -	—	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G7 - 3 & 4
DATE: 87 05 19
TIME: 1415

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	$kg/0.04\ m^3$ (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	312
Water	165	6.600	--	--	--	6.295	0.00630	159
Sand	762	30.480	30.328	34.252	3.772	30.480	0.01155	768
C.A. 20-14 mm	384.667	15.387	15.219					
14-10 mm	384.667	15.387	15.219	47.453	1.292	46.161	0.01733	1163
10- 5 mm	384.667	15.387	15.219					
Air	1.5%	1.5%	--	--	--			1.4%
Totals	2391	95.641	--	--	5.064	95.336	0.03968	2402

Slump, mm - 70
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2425
Workability - Good
Concrete Temperature, °C - 20
W/C -
Comp. Str. @ 28 d, MPa - 33.1, 33.6

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.663
Absorption, % -	0.50	1.09
Fineness Modulus -	2.698	--
Total Water Used - (excess water in aggregates plus extra required)	6.295	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G8 - 1 & 2
DATE: 87 05 20
TIME: 1000

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg.(SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	165	6.600	--	--	--	6.186	0.00619	156
Sand	762	30.480	30.328	33.975	3.495	30.480	0.01155	770
C.A. 20-14 mm	390	15.600	15.508					
14-10 mm	390	15.600	15.508	47.714	0.914	46.800	0.01733	1183
10- 5 mm	390	15.600	15.508					
Air	1.5%	1.5%	--	--	--	1.4%	0.00055	1.4%
Totals	2407	96.280	--	--	4.409	95.866	0.03956	2422

Slump, mm - 70
Air Content, % - 1.4
Unit Weight, kg/m^3 - 2428
Workability - Good
Concrete Temperature, °C - 18
W/C - 0.499
Comp. Str. @ 28 d, MPa - 37.1, 36.0

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.701
Absorption, % -	0.50	0.59
Fineness Modulus -	2.698	
Total Water Used (excess water in aggregates plus extra required) -	6.186	
Extra alkali used (NaOH) -	--	

FILE: 1264-30

ADI LIMITED - ALKALI AGGREGATE REACTION STUDY
CONCRETE MIX DESIGN - PRISM TEST (CSA A23.2-14A)

SOURCE LOCATION: G8 - 3 & 4
DATE: 87 05 20
TIME: 1420

Material	Design Mix Proportions (SSD Agg.)		Weight of Dry Agg.	Weight of Saturated Agg.	Weight of Excess Water in Agg. (SSD)	Final Batch Weights (SSD Agg.)	Volume	Actual Mix Proportions (SSD Agg.)
	kg/m^3	kg/0.04 m^3 (A)	kg	kg (B)	kg (A-B)	kg	m^3	kg/m^3
Cement	310	12.400	--	--	--	12.400	0.00394	313
Water	165	6.600	--	--	--	6.195	0.00620	156
Sand	762	30.480	30.328	34.425	3.945	30.480	0.01155	770
C.A. 20-14 mm	390	15.600	15.508					
14-10 mm	390	15.600	15.508	47.594	0.794	46.800	0.01733	1182
10- 5 mm	390	15.600	15.508					
Air	1.5%	1.5%	--	--	--	1.5%	0.00059	1.5%
Totals	2407	96.280	--	--	4.739	95.875	0.03961	2421

Slump, mm - 70
Air Content, % - 1.5
Unit Weight, kg/m^3 - 2428
Workability - Good
Concrete Temperature, °C - 19
W/C - 0.500
Comp. Str. @ 28 d, MPa - 31.9, 31.4

	Fine Aggregate	Coarse Aggregate
Relative Density (SSD) -	2.638	2.701
Absorption, % -	0.50	0.59
Fineness Modulus -	2.698	
Total Water Used - (excess water in aggregates plus extra required)	6.195	
Extra alkali used (NaOH) - (0.94% - 1.25%)	49.6 g	

STUDY OF
THE ALKALI REACTIVITY
OF
POTENTIAL CONCRETE AGGREGATES
OF
NEW BRUNSWICK

APPENDIX H

EXPANSION TEST RESULTS DATA SHEETS

CONTRACT SERIAL NUMBER OSQ85-00187
CONTRACTOR: ADI LIMITED
DSS REQUISITION NUMBER 23440-4-9236
APPENDIX H

MICROMEDIA

File: 1264-30
Date: November, 1989

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MICROMEDIA

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R1 CSA A23.2 14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	27-Mar-87	Bin 1	0.94	23
2A,B,C	27-Mar-87	Box R1-2	0.94	38
3A,B,C	27-Mar-87	Bin 1	1.25	23
4A,B,C	27-Mar-87	Box R1-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
28-Mar-87	28-Mar-87	1	2.575	2.995	2.808	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.566	2.986	2.797	-0.003	-0.003	-0.003	-0.003
10-Apr-87	10-Apr-87	14	2.568	2.987	2.800	-0.002	-0.002	-0.002	-0.002
24-Apr-87	24-Apr-87	28	2.570	2.990	2.803	-0.001	-0.001	-0.001	-0.001
22-May-87	22-May-87	56	2.547	2.974	2.780	-0.008	-0.006	-0.008	-0.007
19-Jun-87	19-Jun-87	84	2.552	2.971	2.779	-0.007	-0.007	-0.008	-0.007
17-Jul-87	17-Jul-87	112	2.560	2.972	2.785	-0.004	-0.007	-0.007	-0.006
11-Sep-87	11-Sep-87	168	2.556	2.970	2.783	-0.005	-0.007	-0.007	-0.007
08-Jan-88	08-Jan-88	287	2.559	2.975	2.787	-0.005	-0.006	-0.006	-0.005
26-Mar-88	26-Mar-88	365	2.548	2.964	2.781	-0.008	-0.009	-0.008	-0.008
08-Jul-88	08-Jul-88	469	2.568	2.984	2.799	-0.002	-0.003	-0.003	-0.003
23-Sep-88	24-Sep-88	546	2.557	2.974	2.787	-0.005	-0.006	-0.006	-0.006
28-Mar-89	26-Mar-89	732	2.568	2.989	2.804	-0.002	-0.002	-0.001	-0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
28-Mar-87	28-Mar-87	1	2.906	2.189	2.020	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.895	2.176	2.005	-0.003	-0.004	-0.004	-0.004
10-Apr-87	10-Apr-87	14	2.888	2.174	2.005	-0.005	-0.004	-0.004	-0.005
24-Apr-87	24-Apr-87	28	2.910	2.196	2.028	0.001	0.002	0.002	0.002
22-May-87	22-May-87	56	2.890	2.178	2.005	-0.005	-0.003	-0.004	-0.004
19-Jun-87	19-Jun-87	84	2.890	2.176	2.009	-0.005	-0.004	-0.003	-0.004
17-Jul-87	17-Jul-87	112	2.895	2.179	2.011	-0.003	-0.003	-0.003	-0.003
11-Sep-87	11-Sep-87	168	2.895	2.184	2.013	-0.003	-0.001	-0.002	-0.002
08-Jan-88	08-Jan-88	287	2.914	2.204	2.034	0.002	0.004	0.004	0.003
26-Mar-88	26-Mar-88	365	2.894	2.178	2.011	-0.003	-0.003	-0.003	-0.003
08-Jul-88	08-Jul-88	469	2.916	2.203	2.037	0.003	0.004	0.005	0.004
23-Sep-88	24-Sep-88	546	2.904	2.188	2.024	-0.001	.000	0.001	.000
28-Mar-89	26-Mar-89	732	2.925	2.211	2.043	0.005	0.006	0.007	0.006

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R1 CSA A23.2 14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	27-Mar-87	Bin 1	0.94	23
2A,B,C	27-Mar-87	Box R1-2	0.94	38
3A,B,C	27-Mar-87	Bin 1	1.25	23
4A,B,C	27-Mar-87	Box R1-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
28-Mar-87	28-Mar-87	1	2.722	3.676	2.504	0.000	0.000	0.000	0.000
03-Apr-87	03-Apr-87	7	2.728	3.683	2.511	0.002	0.002	0.002	0.002
10-Apr-87	10-Apr-87	14	2.736	3.689	2.518	0.004	0.004	0.004	0.004
24-Apr-87	24-Apr-87	28	2.739	3.695	2.525	0.005	0.005	0.006	0.005
22-May-87	22-May-87	56	2.719	3.673	2.504	-0.001	-0.001	0.000	-0.001
19-Jun-87	19-Jun-87	84	2.717	3.675	2.502	-0.001	.000	-0.001	-0.001
17-Jul-87	17-Jul-87	112	2.724	3.683	2.506	0.001	0.002	0.001	0.001
11-Sep-87	11-Sep-87	168	2.724	3.683	2.506	0.001	0.002	0.001	0.001
08-Jan-88	08-Jan-88	287	2.729	3.687	2.513	0.002	0.003	0.003	0.003
26-Mar-88	26-Mar-88	365	2.722	3.680	2.505	0.000	0.001	.000	.000
08-Jul-88	08-Jul-88	469	2.742	3.697	2.526	0.006	0.006	0.006	0.006
23-Sep-88	24-Sep-88	546	2.736	3.698	2.522	0.004	0.006	0.005	0.005
28-Mar-89	26-Mar-89	732	2.749	3.705	2.533	0.008	0.008	0.008	0.008

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
28-Mar-87	28-Mar-87	1	2.780	2.986	2.845	0.000	0.000	0.000	0.000
04-Apr-87	03-Apr-87	8	2.786	2.994	2.855	0.002	0.002	0.003	0.002
10-Apr-87	10-Apr-87	14	2.784	2.990	2.848	0.001	0.001	0.001	0.001
24-Apr-87	24-Apr-87	28	2.810	3.016	2.873	0.009	0.009	0.008	0.008
22-May-87	22-May-87	56	2.794	3.001	2.860	0.004	0.004	0.004	0.004
19-Jun-87	19-Jun-87	84	2.799	3.007	2.863	0.005	0.006	0.005	0.005
17-Jul-87	17-Jul-87	112	2.809	3.019	2.874	0.008	0.009	0.008	0.009
11-Sep-87	11-Sep-87	168	2.817	3.031	2.883	0.010	0.013	0.011	0.011
08-Jan-88	08-Jan-88	287	2.850	3.077	2.912	0.020	0.026	0.019	0.022
26-Mar-88	26-Mar-88	365	2.826	3.074	2.895	0.013	0.025	0.014	0.017
08-Jul-88	08-Jul-88	469	2.856	3.108	2.920	0.022	0.035	0.021	0.026
23-Sep-88	24-Sep-88	546	2.848	3.107	2.916	0.019	0.034	0.020	0.025
28-Mar-89	26-Mar-89	732	2.858	3.124	2.929	0.022	0.039	0.024	0.028

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R2 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:			Alk %	Temp C
1A,B,C	30-Mar-87	Bin 2	0.94	23
2A,B,C	30-Mar-87	Box R2-2	0.94	38
3A,B,C	30-Mar-87	Bin 2	1.25	23
4A,B,C	30-Mar-87	Box R2-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
31-Mar-87	31-Mar-87	1	3.475	2.059	2.779	0.000	0.000	0.000	0.000
06-Apr-87	06-Apr-87	7	3.480	2.058	2.778	0.001	.000	.000	.000
13-Apr-87	13-Apr-87	14	3.472	2.052	2.771	-0.001	-0.002	-0.002	-0.002
27-Apr-87	27-Apr-87	28	3.470	2.053	2.772	-0.001	-0.002	-0.002	-0.002
25-May-87	25-May-87	56	3.475	2.054	2.772	0.000	-0.001	-0.002	-0.001
22-Jun-87	22-Jun-87	84	3.454	2.031	2.750	-0.006	-0.008	-0.008	-0.007
20-Jul-87	20-Jul-87	112	3.459	2.036	2.757	-0.005	-0.007	-0.006	-0.006
14-Sep-87	14-Sep-87	168	3.453	2.030	2.752	-0.006	-0.008	-0.008	-0.007
11-Jan-88	11-Jan-88	287	3.446	2.024	2.738	-0.008	-0.010	-0.012	-0.010
28-Mar-88	29-Mar-88	364	3.455	2.036	2.751	-0.006	-0.007	-0.008	-0.007
13-Jul-88	13-Jul-88	471	3.466	2.045	2.766	-0.003	-0.004	-0.004	-0.003
26-Sep-88	27-Sep-88	546	3.462	2.042	2.760	-0.004	-0.005	-0.005	-0.005
28-Mar-89	29-Mar-89	729	3.471	2.051	2.770	-0.001	-0.002	-0.003	-0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
31-Mar-87	31-Mar-87	1	2.937	2.486	1.662	0.000	0.000	0.000	0.000
06-Apr-87	06-Apr-87	7	2.937	2.480	1.655	0.000	-0.002	-0.002	-0.001
13-Apr-87	13-Apr-87	14	2.927	2.475	1.651	-0.003	-0.003	-0.003	-0.003
27-Apr-87	27-Apr-87	28	2.928	2.476	1.651	-0.003	-0.003	-0.003	-0.003
25-May-87	25-May-87	56	2.935	2.484	1.658	-0.001	-0.001	-0.001	-0.001
22-Jun-87	22-Jun-87	84	2.905	2.465	1.639	-0.009	-0.006	-0.007	-0.007
20-Jul-87	20-Jul-87	112	2.907	2.459	1.632	-0.009	-0.008	-0.009	-0.008
14-Sep-87	14-Sep-87	168	2.903	2.454	1.626	-0.010	-0.009	-0.010	-0.010
11-Jan-88	11-Jan-88	287	2.898	2.446	1.624	-0.011	-0.011	-0.011	-0.011
28-Mar-88	29-Mar-88	364	2.924	2.473	1.643	-0.004	-0.004	-0.005	-0.004
13-Jul-88	13-Jul-88	471	2.932	2.481	1.655	-0.001	-0.001	-0.002	-0.002
26-Sep-88	27-Sep-88	546	2.925	2.474	1.651	-0.003	-0.003	-0.003	-0.003
28-Mar-89	29-Mar-89	729	2.936	2.488	1.659	.000	0.001	-0.001	.000

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R2 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	30-Mar-87	Bin 2	0.94	23	
2A,B,C	30-Mar-87	Box R2-2	0.94	38	
3A,B,C	30-Mar-87	Bin 2	1.25	23	352.806 mm
4A,B,C	30-Mar-87	Box R2-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
31-Mar-87	31-Mar-87	1	2.002	2.955	2.968	0.000	0.000	0.000	0.000
06-Apr-87	06-Apr-87	7	2.008	2.960	2.974	0.002	0.001	0.002	0.002
13-Apr-87	13-Apr-87	14	2.005	2.957	2.971	0.001	0.001	0.001	0.001
27-Apr-87	27-Apr-87	28	2.008	2.958	2.973	0.002	0.001	0.001	0.001
25-May-87	25-May-87	56	2.009	2.961	2.973	0.002	0.002	0.001	0.002
22-Jun-87	22-Jun-87	84	1.989	2.943	2.959	-0.004	-0.003	-0.003	-0.003
20-Jul-87	20-Jul-87	112	1.995	2.948	2.960	-0.002	-0.002	-0.002	-0.002
14-Sep-87	14-Sep-87	168	1.989	2.929	2.940	-0.004	-0.007	-0.008	-0.006
11-Jan-88	11-Jan-88	287	1.984	2.935	2.946	-0.005	-0.006	-0.006	-0.006
28-Mar-88	29-Mar-88	364	1.995	2.946	2.962	-0.002	-0.003	-0.002	-0.002
13-Jul-88	13-Jul-88	471	2.010	2.964	2.969	0.002	0.003	.000	0.002
26-Sep-88	27-Sep-88	546	2.003	2.953	2.965	.000	-0.001	-0.001	.000
28-Mar-89	29-Mar-89	729	2.019	2.967	2.978	0.005	0.003	0.003	0.004

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
31-Mar-87	31-Mar-87	1	2.788	2.184	3.008	0.000	0.000	0.000	0.000
06-Apr-87	06-Apr-87	7	2.788	2.183	3.009	0.000	.000	.000	.000
13-Apr-87	13-Apr-87	14	2.784	2.177	3.002	-0.001	-0.002	-0.002	-0.002
27-Apr-87	27-Apr-87	28	2.768	2.164	2.988	-0.006	-0.006	-0.006	-0.006
25-May-87	25-May-87	56	2.786	2.183	3.009	-0.001	.000	.000	.000
22-Jun-87	22-Jun-87	84	2.773	2.168	2.992	-0.004	-0.005	-0.005	-0.004
20-Jul-87	20-Jul-87	112	2.757	2.152	2.979	-0.009	-0.009	-0.008	-0.009
14-Sep-87	14-Sep-87	168	2.762	2.161	2.989	-0.007	-0.007	-0.005	-0.006
11-Jan-88	11-Jan-88	287	2.761	2.163	2.988	-0.008	-0.006	-0.006	-0.006
28-Mar-88	29-Mar-88	364	2.793	2.193	3.016	0.001	0.003	0.002	0.002
13-Jul-88	13-Jul-88	471	2.800	2.205	3.021	0.003	0.006	0.004	0.004
26-Sep-88	27-Sep-88	546	2.797	2.200	3.023	0.003	0.005	0.004	0.004
28-Mar-89	29-Mar-89	729	2.808	2.214	3.039	0.006	0.009	0.009	0.008

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R3 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Nicholas Denys

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	31-Mar-87	Bin 3	0.94	23	
2A,B,C	31-Mar-87	Box R3-2	0.94	38	
3A,B,C	31-Mar-87	Bin 3	1.25	23	352.806 mm
4A,B,C	31-Mar-87	Box R3-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
01-Apr-87	01-Apr-87	1	1.909	3.596	2.317	0.000	0.000	0.000	0.000
07-Apr-87	07-Apr-87	7	1.909	3.593	2.316	0.000	-0.001	.000	.000
14-Apr-87	14-Apr-87	14	1.909	3.597	2.316	0.000	.000	.000	.000
28-Apr-87	28-Apr-87	28	1.915	3.601	2.321	0.002	0.001	0.001	0.001
26-May-87	26-May-87	56	1.896	3.581	2.302	-0.004	-0.004	-0.004	-0.004
23-Jun-87	23-Jun-87	84	1.887	3.571	2.294	-0.006	-0.007	-0.007	-0.007
21-Jul-87	21-Jul-87	112	1.896	3.580	2.299	-0.004	-0.005	-0.005	-0.004
15-Sep-87	15-Sep-87	168	1.883	3.568	2.288	-0.007	-0.008	-0.008	-0.008
12-Jan-88	12-Jan-88	287	1.902	3.586	2.305	-0.002	-0.003	-0.003	-0.003
29-Mar-88	30-Mar-88	364	1.896	3.585	2.306	-0.004	-0.003	-0.003	-0.003
14-Jul-88	14-Jul-88	471	1.902	3.583	2.303	-0.002	-0.004	-0.004	-0.003
27-Sep-88	28-Sep-88	546	1.905	3.588	2.307	-0.001	-0.002	-0.003	-0.002
28-Mar-89	30-Mar-89	728	1.910	3.593	2.314	.000	-0.001	-0.001	.000

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
01-Apr-87	01-Apr-87	1	2.388	2.295	3.502	0.000	0.000	0.000	0.000
07-Apr-87	07-Apr-87	7	2.385	2.294	3.500	-0.001	.000	-0.001	-0.001
14-Apr-87	14-Apr-87	14	2.384	2.294	3.502	-0.001	.000	0.000	.000
28-Apr-87	28-Apr-87	28	2.382	2.290	3.498	-0.002	-0.001	-0.001	-0.001
26-May-87	26-May-87	56	2.370	2.280	3.489	-0.005	-0.004	-0.004	-0.004
23-Jun-87	23-Jun-87	84	2.366	2.276	3.483	-0.006	-0.005	-0.005	-0.006
21-Jul-87	21-Jul-87	112	2.368	2.278	3.486	-0.006	-0.005	-0.005	-0.005
15-Sep-87	15-Sep-87	168	2.363	2.269	3.482	-0.007	-0.007	-0.006	-0.007
12-Jan-88	12-Jan-88	287	2.379	2.291	3.494	-0.003	-0.001	-0.002	-0.002
29-Mar-88	30-Mar-88	364	2.383	2.290	3.499	-0.001	-0.001	-0.001	-0.001
14-Jul-88	14-Jul-88	471	2.381	2.296	3.497	-0.002	.000	-0.001	-0.001
27-Sep-88	28-Sep-88	546	2.365	2.278	3.484	-0.007	-0.005	-0.005	-0.005
29-Mar-89	30-Mar-89	729	2.387	2.302	3.500	.000	0.002	-0.001	.000

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R3 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Nicholas Denys

Dates Cast:

			Alk %	Temp C
1A,B,C	31-Mar-87	Bin 3	0.94	23
2A,B,C	31-Mar-87	Box R3-2	0.94	38
3A,B,C	31-Mar-87	Bin 3	1.25	23
4A,B,C	31-Mar-87	Box R3-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
01-Apr-87	01-Apr-87	1	2.395	2.483	2.208	0.000	0.000	0.000	0.000
07-Apr-87	07-Apr-87	7	2.401	2.491	2.214	0.002	0.002	0.002	0.002
14-Apr-87	14-Apr-87	14	2.405	2.495	2.218	0.003	0.003	0.003	0.003
28-Apr-87	28-Apr-87	28	2.409	2.496	2.217	0.004	0.004	0.003	0.003
26-May-87	26-May-87	56	2.389	2.478	2.204	-0.002	-0.001	-0.001	-0.001
23-Jun-87	23-Jun-87	84	2.386	2.477	2.196	-0.003	-0.002	-0.003	-0.003
21-Jul-87	21-Jul-87	112	2.387	2.479	2.201	-0.002	-0.001	-0.002	-0.002
15-Sep-87	15-Sep-87	168	2.378	2.465	2.189	-0.005	-0.005	-0.005	-0.005
12-Jan-88	12-Jan-88	287	2.398	2.483	2.207	0.001	0.000	.000	.000
29-Mar-88	30-Mar-88	364	2.393	2.482	2.205	-0.001	.000	-0.001	-0.001
14-Jul-88	14-Jul-88	471	2.396	2.486	2.206	.000	0.001	-0.001	.000
27-Sep-88	28-Sep-88	546	2.400	2.491	2.211	0.001	0.002	0.001	0.002
28-Mar-69	30-Mar-89	728	2.405	2.494	2.220	0.003	0.003	0.003	0.003

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
01-Apr-87	01-Apr-87	1	2.551	3.358	2.094	0.000	0.000	0.000	0.000
07-Apr-87	07-Apr-87	7	2.563	3.369	2.105	0.003	0.003	0.003	0.003
14-Apr-87	14-Apr-87	14	2.563	3.367	2.105	0.003	0.003	0.003	0.003
28-Apr-87	28-Apr-87	28	2.560	3.365	2.102	0.003	0.002	0.002	0.002
26-May-87	26-May-87	56	2.551	3.360	2.095	0.000	0.001	.000	.000
23-Jun-87	23-Jun-87	84	2.544	3.352	2.086	-0.002	-0.002	-0.002	-0.002
21-Jul-87	21-Jul-87	112	2.546	3.351	2.090	-0.001	-0.002	-0.001	-0.002
15-Sep-87	15-Sep-87	168	2.541	3.352	2.086	-0.003	-0.002	-0.002	-0.002
12-Jan-88	12-Jan-88	287	2.563	3.373	2.110	0.003	0.004	0.005	0.004
29-Mar-88	30-Mar-88	364	2.571	3.383	2.112	0.006	0.007	0.005	0.006
14-Jul-88	14-Jul-88	471	2.570	3.380	2.116	0.005	0.006	0.006	0.006
27-Sep-88	28-Sep-88	546	2.565	3.379	2.116	0.004	0.006	0.006	0.005
29-Mar-89	30-Mar-89	729	2.575	3.391	2.124	0.007	0.009	0.009	0.008

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R4 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

Dates Cast:

			Alk %	Temp C
1A,B,C	02-Apr-87	Bin 5	0.94	23
2A,B,C	02-Apr-87	Box R4-2	0.94	38
3A,B,C	02-Apr-87	Bin 5	1.25	23
4A,B,C	02-Apr-87	Box R4-4	1.25	38

Sample Lengths:

353 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
03-Apr-87	03-Apr-87	1	2.018	3.043	2.419	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.020	3.046	2.424	0.001	0.001	0.001	0.001
16-Apr-87	16-Apr-87	14	2.020	3.041	2.420	0.001	-0.001	.000	.000
30-Apr-87	30-Apr-87	28	2.030	3.049	2.428	0.003	0.002	0.003	0.003
28-May-87	28-May-87	56	1.997	3.017	2.400	-0.006	-0.007	-0.005	-0.006
25-Jun-87	25-Jun-87	84	2.002	3.023	2.403	-0.005	-0.006	-0.005	-0.005
23-Jul-87	23-Jul-87	112	1.998	3.017	2.399	-0.006	-0.007	-0.006	-0.006
17-Sep-87	17-Sep-87	168	2.002	3.021	2.402	-0.005	-0.006	-0.005	-0.005
14-Jan-88	14-Jan-88	287	2.004	3.025	2.403	-0.004	-0.005	-0.005	-0.005
31-Mar-88	01-Apr-88	364	1.960	2.978	2.373	-0.016	-0.018	-0.013	-0.016
14-Jul-88	14-Jul-88	469	2.006	3.022	2.405	-0.003	-0.006	-0.004	-0.004
29-Sep-88	30-Sep-88	546	2.012	3.024	2.409	-0.002	-0.005	-0.003	-0.003
31-Mar-89	01-Apr-89	729	2.007	3.028	2.411	-0.003	-0.004	-0.002	-0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
03-Apr-87	03-Apr-87	1	2.231	3.554	2.236	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.215	3.538	2.223	-0.005	-0.005	-0.004	-0.004
16-Apr-87	16-Apr-87	14	2.216	3.539	2.225	-0.004	-0.004	-0.003	-0.004
30-Apr-87	30-Apr-87	28	2.227	3.552	2.235	-0.001	-0.001	.000	-0.001
28-May-87	28-May-87	56	2.201	3.528	2.214	-0.009	-0.007	-0.006	-0.007
25-Jun-87	25-Jun-87	84	2.205	3.532	2.216	-0.007	-0.006	-0.006	-0.006
23-Jul-87	23-Jul-87	112	2.199	3.522	2.210	-0.009	-0.009	-0.007	-0.009
17-Sep-87	17-Sep-87	168	2.210	3.534	2.219	-0.006	-0.006	-0.005	-0.005
14-Jan-88	14-Jan-88	287	2.214	3.536	2.225	-0.005	-0.005	-0.003	-0.004
31-Mar-88	01-Apr-88	364	2.190	3.516	2.196	-0.012	-0.011	-0.011	-0.011
14-Jul-88	14-Jul-88	469	2.213	3.544	2.226	-0.005	-0.003	-0.003	-0.004
29-Sep-88	30-Sep-88	546	2.222	3.552	2.231	-0.003	-0.001	-0.001	-0.002
31-Mar-89	01-Apr-89	729	2.222	3.548	2.237	-0.003	-0.002	.000	-0.001

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R4 CSA A23.2-14A

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

Dates Cast:

			Alk %	Temp C
1A,B,C	02-Apr-87	Bin 5	0.94	23
2A,B,C	02-Apr-87	Box R4-2	0.94	38
3A,B,C	02-Apr-87	Bin 5	1.25	23
4A,B,C	02-Apr-87	Box R4-4	1.25	38

Sample Lengths:

353 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
03-Apr-87	03-Apr-87	1	2.161	5.418	3.669	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.183	5.448	3.691	0.006	0.009	0.006	0.007
16-Apr-87	16-Apr-87	14	2.179	5.438	3.681	0.005	0.006	0.003	0.005
30-Apr-87	30-Apr-87	28	2.186	5.450	3.693	0.007	0.009	0.007	0.008
28-May-87	28-May-87	56	2.162	5.424	3.668	.000	0.002	.000	0.001
25-Jun-87	25-Jun-87	84	2.164	5.429	3.676	0.001	0.003	0.002	0.002
23-Jul-87	23-Jul-87	112	2.160	5.422	3.667	.000	0.001	-0.001	.000
17-Sep-87	17-Sep-87	168	2.165	5.430	3.673	0.001	0.003	0.001	0.002
14-Jan-88	14-Jan-88	287	2.167	5.429	3.676	0.002	0.003	0.002	0.002
31-Mar-88	01-Apr-88	364	2.138	5.405	3.656	-0.007	-0.004	-0.004	-0.005
14-Jul-88	14-Jul-88	469	2.166	5.431	3.678	0.001	0.004	0.003	0.003
29-Sep-88	30-Sep-88	546	2.175	5.434	3.683	0.004	0.005	0.004	0.004
31-Mar-89	01-Apr-89	729	2.180	5.443	3.693	0.005	0.007	0.007	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
03-Apr-87	03-Apr-87	1	2.597	2.895	2.743	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.607	2.899	2.750	0.003	0.001	0.002	0.002
16-Apr-87	16-Apr-87	14	2.605	2.901	2.753	0.002	0.002	0.003	0.002
30-Apr-87	30-Apr-87	28	2.611	2.907	2.760	0.004	0.003	0.005	0.004
28-May-87	28-May-87	56	2.590	2.886	2.739	-0.002	-0.003	-0.001	-0.002
25-Jun-87	25-Jun-87	84	2.597	2.896	2.750	0.000	.000	0.002	0.001
23-Jul-87	23-Jul-87	112	2.595	2.890	2.749	-0.001	-0.001	0.002	.000
17-Sep-87	17-Sep-87	168	2.613	2.920	2.769	0.005	0.007	0.007	0.006
14-Jan-88	14-Jan-88	287	2.627	2.977	2.828	0.009	0.023	0.024	0.019
31-Mar-88	01-Apr-88	364	2.608	2.969	2.822	0.003	0.021	0.022	0.015
14-Jul-88	14-Jul-88	469	2.634	2.997	2.854	0.010	0.029	0.031	0.024
29-Sep-88	30-Sep-88	546	2.638	3.005	2.857	0.012	0.031	0.032	0.025
31-Mar-89	01-Apr-89	729	2.637	3.005	2.854	0.011	0.031	0.031	0.025

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R5 CSA A23.2-14A

Rock Type: Schist

Locality: Saint John

	Dates Cast:		Alk %	Temp C
1A,B,C	03-Apr-87	Bin 6	0.94	23
2A,B,C	03-Apr-87	Box R5-2	0.94	38
3A,B,C	03-Apr-87	Bin 6	1.25	23
4A,B,C	03-Apr-87	Box R5-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
04-Apr-87	04-Apr-87	1	2.847	2.265	1.875	0.000	0.000	0.000	0.000
10-Apr-87	10-Apr-87	7	2.843	2.264	1.875	-0.001	.000	0.000	.000
17-Apr-87	17-Apr-87	14	2.844	2.264	1.877	-0.001	.000	0.001	.000
01-May-87	01-May-87	28	2.838	2.258	1.872	-0.003	-0.002	-0.001	-0.002
29-May-87	29-May-87	56	2.833	2.251	1.866	-0.004	-0.004	-0.003	-0.003
26-Jun-87	26-Jun-87	84	2.837	2.253	1.865	-0.003	-0.003	-0.003	-0.003
24-Jul-87	24-Jul-87	112	2.830	2.244	1.856	-0.005	-0.006	-0.005	-0.005
18-Sep-87	18-Sep-87	168	2.830	2.244	1.856	-0.005	-0.006	-0.005	-0.005
15-Jan-88	15-Jan-88	287	2.856	2.269	1.879	0.003	0.001	0.001	0.002
31-Mar-88	02-Apr-88	363	2.810	2.237	1.841	-0.010	-0.008	-0.010	-0.009
14-Jul-88	14-Jul-88	468	2.842	2.253	1.865	-0.001	-0.003	-0.003	-0.003
30-Sep-88	01-Oct-88	546	2.842	2.260	1.873	-0.001	-0.001	-0.001	-0.001
31-Mar-89	02-Apr-89	728	2.851	2.270	1.881	0.001	0.001	0.002	0.001

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
04-Apr-87	04-Apr-87	1	1.985	2.920	3.413	0.000	0.000	0.000	0.000
10-Apr-87	10-Apr-87	7	1.974	2.912	3.402	-0.003	-0.002	-0.003	-0.003
17-Apr-87	17-Apr-87	14	1.986	2.921	3.413	.000	.000	0.000	.000
01-May-87	01-May-87	28	1.977	2.914	3.406	-0.002	-0.002	-0.002	-0.002
29-May-87	29-May-87	56	1.972	2.910	3.400	-0.004	-0.003	-0.004	-0.003
26-Jun-87	26-Jun-87	84	1.979	2.918	3.407	-0.002	-0.001	-0.002	-0.001
24-Jul-87	24-Jul-87	112	1.976	2.909	3.400	-0.003	-0.003	-0.004	-0.003
18-Sep-87	18-Sep-87	168	1.969	2.907	3.397	-0.005	-0.004	-0.005	-0.004
15-Jan-88	15-Jan-88	287	2.002	2.943	3.433	0.005	0.007	0.006	0.006
31-Mar-88	02-Apr-88	363	1.959	2.907	3.390	-0.007	-0.004	-0.007	-0.006
14-Jul-88	14-Jul-88	468	1.997	2.940	3.427	0.003	0.006	0.004	0.004
01-Oct-88	01-Oct-88	547	1.998	2.944	3.433	0.004	0.007	0.006	0.005
31-Mar-89	02-Apr-89	728	2.012	2.958	3.427	0.008	0.011	0.004	0.007

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R5 CSA A23.2-14A

Rock Type: Schist

Locality: Saint John

Dates Cast:

			Alk %	Temp C
1A,B,C	03-Apr-87	Bin 6	0.94	23
2A,B,C	03-Apr-87	Box R5-2	0.94	38
3A,B,C	03-Apr-87	Bin 6	1.25	23
4A,B,C	03-Apr-87	Box R5-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
04-Apr-87	04-Apr-87	1	3.456	2.600	2.723	0.000	0.000	0.000	0.000
10-Apr-87	10-Apr-87	7	3.470	2.616	2.736	0.004	0.005	0.004	0.004
17-Apr-87	17-Apr-87	14	3.461	2.607	2.726	0.001	0.002	0.001	0.001
01-May-87	01-May-87	28	3.463	2.608	2.733	0.002	0.002	0.003	0.002
29-May-87	29-May-87	56	3.454	2.598	2.725	-0.001	-0.001	0.001	.000
26-Jun-87	26-Jun-87	84	3.461	2.606	2.728	0.001	0.002	0.001	0.002
24-Jul-87	24-Jul-87	112	3.453	2.591	2.720	-0.001	-0.003	-0.001	-0.001
18-Sep-87	18-Sep-87	168	3.455	2.599	2.722	.000	.000	.000	.000
15-Jan-88	15-Jan-88	287	3.480	2.622	2.750	0.007	0.006	0.008	0.007
31-Mar-88	02-Apr-88	363	3.450	2.590	2.716	-0.002	-0.003	-0.002	-0.002
14-Jul-88	14-Jul-88	468	3.468	2.612	2.735	0.003	0.003	0.003	0.003
30-Sep-88	01-Oct-88	546	3.479	2.617	2.740	0.007	0.005	0.005	0.005
31-Mar-89	02-Apr-89	728	3.490	2.626	2.753	0.010	0.007	0.009	0.009

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
04-Apr-87	04-Apr-87	1	1.698	2.718	2.570	0.000	0.000	0.000	0.000
10-Apr-87	10-Apr-87	7	1.704	2.721	2.572	0.002	0.001	0.001	0.001
17-Apr-87	17-Apr-87	14	1.719	2.735	2.585	0.006	0.005	0.004	0.005
01-May-87	01-May-87	28	1.713	2.731	2.581	0.004	0.004	0.003	0.004
29-May-87	29-May-87	56	1.704	2.724	2.572	0.002	0.002	0.001	0.001
26-Jun-87	26-Jun-87	84	1.716	2.737	2.586	0.005	0.005	0.005	0.005
24-Jul-87	24-Jul-87	112	1.711	2.731	2.581	0.004	0.004	0.003	0.003
18-Sep-87	18-Sep-87	168	1.717	2.742	2.589	0.005	0.007	0.005	0.006
15-Jan-88	15-Jan-88	287	1.772	2.815	2.650	0.021	0.027	0.023	0.024
31-Mar-88	02-Apr-88	363	1.754	2.803	2.625	0.016	0.024	0.016	0.019
14-Jul-88	14-Jul-88	468	1.786	2.846	2.668	0.025	0.036	0.028	0.030
30-Sep-88	01-Oct-88	546	1.799	2.862	2.672	0.029	0.041	0.029	0.033
31-Mar-89	02-Apr-89	728	1.817	2.883	2.689	0.034	0.047	0.034	0.038

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R6 CSA A23.2-14A

Rock Type: Schist

Locality: Highway 430

Dates Cast:

			Alk %	Temp C
1A,B,C	06-Apr-87	Bin 7	0.94	23
2A,B,C	06-Apr-87	Box R6-2	0.94	38
3A,B,C	06-Apr-87	Bin 7	1.25	23
4A,B,C	06-Apr-87	Box R6-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
07-Apr-87	07-Apr-87	1	2.982	2.453	2.350	0.000	0.000	0.000	0.000
13-Apr-87	13-Apr-87	7	2.983	2.451	2.345	.000	-0.001	-0.001	-0.001
20-Apr-87	20-Apr-87	14	2.975	2.445	2.342	-0.002	-0.003	-0.002	-0.002
04-May-87	04-May-87	28	2.968	2.439	2.337	-0.004	-0.004	-0.004	-0.004
01-Jun-87	01-Jun-87	56	2.963	2.431	2.325	-0.005	-0.006	-0.007	-0.006
29-Jun-87	29-Jun-87	84	2.969	2.439	2.333	-0.004	-0.004	-0.005	-0.004
27-Jul-87	27-Jul-87	112	2.968	2.442	2.336	-0.004	-0.003	-0.004	-0.004
21-Sep-87	21-Sep-87	168	2.961	2.436	2.331	-0.006	-0.005	-0.005	-0.005
18-Jan-88	18-Jan-88	287	2.958	2.431	2.325	-0.007	-0.006	-0.007	-0.007
04-Apr-88	05-Apr-88	364	2.955	2.430	2.323	-0.008	-0.007	-0.008	-0.007
03-Oct-88	04-Oct-88	546	2.974	2.448	2.340	-0.002	-0.001	-0.003	-0.002
03-Apr-89	05-Apr-89	728	2.975	2.450	2.340	-0.002	-0.001	-0.003	-0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
07-Apr-87	07-Apr-87	1	2.635	2.768	2.205	0.000	0.000	0.000	0.000
13-Apr-87	13-Apr-87	7	2.624	2.752	2.190	-0.003	-0.005	-0.004	-0.004
20-Apr-87	20-Apr-87	14	2.618	2.751	2.189	-0.005	-0.005	-0.005	-0.005
04-May-87	04-May-87	28	2.622	2.757	2.194	-0.004	-0.003	-0.003	-0.003
01-Jun-87	01-Jun-87	56	2.612	2.744	2.179	-0.007	-0.007	-0.007	-0.007
29-Jun-87	29-Jun-87	84	2.620	2.751	2.186	-0.004	-0.005	-0.005	-0.005
27-Jul-87	27-Jul-87	112	2.619	2.750	2.182	-0.005	-0.005	-0.007	-0.005
21-Sep-87	21-Sep-87	168	2.614	2.744	2.180	-0.006	-0.007	-0.007	-0.007
18-Jan-88	18-Jan-88	287	2.595	2.725	2.164	-0.011	-0.012	-0.012	-0.012
04-Apr-88	05-Apr-88	364	2.606	2.733	2.173	-0.008	-0.010	-0.009	-0.009
03-Oct-88	04-Oct-88	546	2.628	2.755	2.194	-0.002	-0.004	-0.003	-0.003
03-Apr-89	05-Apr-89	728	2.629	2.762	2.197	-0.002	-0.002	-0.002	-0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R6 CSA A23.2-14A

Rock Type: Schist

Locality: Highway 430

Dates Cast:

			Alk %	Temp C
1A,B,C	06-Apr-87	Bin 7	0.94	23
2A,B,C	06-Apr-87	Box R6-2	0.94	38
3A,B,C	06-Apr-87	Bin 7	1.25	23
4A,B,C	06-Apr-87	Box R6-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
07-Apr-87	07-Apr-87	1	2.728	3.120	2.236	0.000	0.000	0.000	0.000
13-Apr-87	13-Apr-87	7	2.732	3.121	2.236	0.001	.000	0.000	.000
20-Apr-87	20-Apr-87	14	2.723	3.122	2.239	-0.001	0.001	0.001	.000
04-May-87	04-May-87	28	2.724	3.118	2.234	-0.001	-0.001	-0.001	-0.001
01-Jun-87	01-Jun-87	56	2.709	3.112	2.226	-0.005	-0.002	-0.003	-0.003
29-Jun-87	29-Jun-87	84	2.718	3.113	2.230	-0.003	-0.002	-0.002	-0.002
27-Jul-87	27-Jul-87	112	2.725	3.121	2.239	-0.001	.000	0.001	.000
21-Sep-87	21-Sep-87	168	2.717	3.115	2.233	-0.003	-0.001	-0.001	-0.002
18-Jan-88	18-Jan-88	287	2.697	3.103	2.218	-0.009	-0.005	-0.005	-0.006
04-Apr-88	05-Apr-88	364	2.707	3.105	2.223	-0.006	-0.004	-0.004	-0.005
03-Oct-88	04-Oct-88	546	2.727	3.125	2.240	.000	0.001	0.001	0.001
03-Apr-89	05-Apr-89	728	2.729	3.131	2.244	.000	0.003	0.002	0.002

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
07-Apr-87	07-Apr-87	1	2.316	2.729	2.013	0.000	0.000	0.000	0.000
13-Apr-87	13-Apr-87	7	2.319	2.734	2.018	0.001	0.001	0.001	0.001
20-Apr-87	20-Apr-87	14	2.313	2.726	2.010	-0.001	-0.001	-0.001	-0.001
04-May-87	04-May-87	28	2.317	2.731	2.014	.000	0.001	.000	.000
01-Jun-87	01-Jun-87	56	2.305	2.721	2.005	-0.003	-0.002	-0.002	-0.003
29-Jun-87	29-Jun-87	84	2.307	2.725	2.010	-0.003	-0.001	-0.001	-0.002
27-Jul-87	27-Jul-87	112	2.309	2.725	2.010	-0.002	-0.001	-0.001	-0.001
21-Sep-87	21-Sep-87	168	2.303	2.720	2.007	-0.004	-0.003	-0.002	-0.003
18-Jan-88	18-Jan-88	287	2.301	2.716	2.002	-0.004	-0.004	-0.003	-0.004
04-Apr-88	05-Apr-88	364	2.300	2.717	2.002	-0.005	-0.003	-0.003	-0.004
03-Oct-88	04-Oct-88	546	2.320	2.735	2.013	0.001	0.002	0.000	0.001
03-Apr-89	05-Apr-89	728	2.325	2.744	2.022	0.003	0.004	0.003	0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R7 CSA 23.2-14A

Rock Type: Meta-greywacke

Locality: St Francois-de-M

Dates Cast:

			Alk %	Temp C
1A,B,C	07-Apr-87	Bin 8	0.94	23
2A,B,C	07-Apr-87	Box R7-2	0.94	38
3A,B,C	07-Apr-87	Bin 8	1.25	23
4A,B,C	07-Apr-87	Box R7-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
08-Apr-87	08-Apr-87	1	2.818	2.731	2.971	0.000	0.000	0.000	0.000
14-Apr-87	14-Apr-87	7	2.814	2.730	2.966	-0.001	.000	-0.001	-0.001
21-Apr-87	21-Apr-87	14	2.806	2.722	2.959	-0.003	-0.003	-0.003	-0.003
05-May-87	05-May-87	28	2.797	2.711	2.953	-0.006	-0.006	-0.005	-0.006
02-Jun-87	02-Jun-87	56	2.788	2.707	2.951	-0.009	-0.007	-0.006	-0.007
30-Jun-87	30-Jun-87	84	2.796	2.711	2.954	-0.006	-0.006	-0.005	-0.006
28-Jul-87	28-Jul-87	112	2.800	2.714	2.957	-0.005	-0.005	-0.004	-0.005
22-Sep-87	22-Sep-87	168	2.803	2.723	2.957	-0.004	-0.002	-0.004	-0.003
19-Jan-88	19-Jan-88	287	2.803	2.722	2.954	-0.004	-0.003	-0.005	-0.004
05-Apr-88	06-Apr-88	364	2.801	2.713	2.954	-0.005	-0.005	-0.005	-0.005
14-Jul-88	14-Jul-88	464	2.812	2.725	2.966	-0.002	-0.002	-0.001	-0.002
04-Oct-88	05-Oct-88	546	2.815	2.727	2.970	-0.001	-0.001	.000	-0.001
04-Apr-89	06-Apr-89	728	2.823	2.735	2.979	0.001	0.001	0.002	0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
08-Apr-87	08-Apr-87	1	2.345	3.010	3.213	0.000	0.000	0.000	0.000
14-Apr-87	14-Apr-87	7	2.335	3.001	3.205	-0.003	-0.003	-0.002	-0.003
21-Apr-87	21-Apr-87	14	2.323	2.991	3.190	-0.006	-0.005	-0.007	-0.006
05-May-87	05-May-87	28	2.331	2.996	3.197	-0.004	-0.004	-0.005	-0.004
02-Jun-87	02-Jun-87	56	2.333	2.996	3.197	-0.003	-0.004	-0.005	-0.004
30-Jun-87	30-Jun-87	84	2.343	3.007	3.203	-0.001	-0.001	-0.003	-0.001
28-Jul-87	28-Jul-87	112	2.351	3.016	3.219	0.002	0.002	0.002	0.002
22-Sep-87	22-Sep-87	168	2.383	3.070	3.254	0.011	0.017	0.012	0.013
19-Jan-88	19-Jan-88	287	2.440	3.210	3.327	0.027	0.057	0.032	0.039
05-Apr-88	06-Apr-88	364	2.463	3.294	3.367	0.033	0.080	0.044	0.053
14-Jul-88	14-Jul-88	464	2.483	3.346	3.386	0.039	0.095	0.049	0.061
04-Oct-88	05-Oct-88	546	2.486	3.363	3.400	0.040	0.100	0.053	0.064
04-Apr-89	06-Apr-89	728	2.506	3.385	3.413	0.046	0.106	0.057	0.070

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R7 CSA 23.2-14A

Rock Type: Meta-greywacke

Locality: St Francois-de-M

Dates Cast:

			Alk %	Temp C
1A,B,C	07-Apr-87	Bin 8	0.94	23
2A,B,C	07-Apr-87	Box R7-2	0.94	38
3A,B,C	07-Apr-87	Bin 8	1.25	23
4A,B,C	07-Apr-87	Box R7-4	1.25	38

Sample Lengths:

352.806 mm

04-Apr-89	06-Apr-89	728	2.506	3.385	3.413	0.046	0.106	0.057	0.070

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
08-Apr-87	08-Apr-87	1	3.216	1.873	2.998	0.000	0.000	0.000	0.000
14-Apr-87	14-Apr-87	7	3.210	1.879	2.995	-0.002	0.002	-0.001	.000
21-Apr-87	21-Apr-87	14	3.212	1.870	2.994	-0.001	-0.001	-0.001	-0.001
05-May-87	05-May-87	28	3.204	1.862	2.985	-0.003	-0.003	-0.004	-0.003
02-Jun-87	02-Jun-87	56	3.208	1.867	2.984	-0.002	-0.002	-0.004	-0.003
30-Jun-87	30-Jun-87	84	3.211	1.862	2.990	-0.001	-0.003	-0.002	-0.002
28-Jul-87	28-Jul-87	112	3.213	1.865	2.992	-0.001	-0.002	-0.002	-0.002
22-Sep-87	22-Sep-87	168	3.212	1.870	2.995	-0.001	-0.001	-0.001	-0.001
19-Jan-88	19-Jan-88	287	3.226	1.884	3.006	0.003	0.003	0.002	0.003
05-Apr-88	06-Apr-88	364	3.225	1.883	3.001	0.003	0.003	0.001	0.002
14-Jul-88	14-Jul-88	464	3.239	1.897	3.019	0.007	0.007	0.006	0.006
04-Oct-88	05-Oct-88	546	3.240	1.902	3.027	0.007	0.008	0.008	0.008
04-Apr-89	06-Apr-89	728	3.251	1.911	3.035	0.010	0.011	0.010	0.010

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
08-Apr-87	08-Apr-87	1	3.477	2.372	2.472	0.000	0.000	0.000	0.000
14-Apr-87	14-Apr-87	7	3.471	2.374	2.473	-0.002	0.001	.000	.000
21-Apr-87	21-Apr-87	14	3.468	2.363	2.466	-0.003	-0.003	-0.002	-0.002
05-May-87	05-May-87	28	3.480	2.374	2.480	0.001	0.001	0.002	0.001
02-Jun-87	02-Jun-87	56	3.514	2.402	2.506	0.010	0.009	0.010	0.010
30-Jun-87	30-Jun-87	84	3.647	2.517	2.588	0.048	0.041	0.033	0.041
28-Jul-87	28-Jul-87	112	3.886	2.737	2.762	0.116	0.103	0.082	0.101
22-Sep-87	22-Sep-87	168	4.355	3.120	3.094	0.249	0.212	0.176	0.212
19-Jan-88	19-Jan-88	287	4.669	3.365	3.324	0.338	0.281	0.241	0.287
05-Apr-88	06-Apr-88	364	4.707	3.453	3.360	0.349	0.306	0.252	0.302
14-Jul-88	14-Jul-88	464	4.737	3.497	3.387	0.357	0.319	0.259	0.312
04-Oct-88	05-Oct-88	546	4.744	3.507	3.398	0.359	0.322	0.262	0.314
04-Apr-89	06-Apr-89	728	4.750	3.516	3.401	0.361	0.324	0.263	0.316

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R8 CSA 23.2-14A

Rock Type: Greywacke

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	08-Apr-87	Bin 9	0.94	23
2A,B,C	08-Apr-87	Box R8-2	0.94	38
3A,B,C	09-Apr-87	Bin 9	1.25	23
4A,B,C	09-Apr-87	Box R8-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
09-Apr-87	09-Apr-87	1	1.989	3.276	2.761	0.000	0.000	0.000	0.000
15-Apr-87	15-Apr-87	7	1.972	3.261	2.746	-0.005	-0.004	-0.004	-0.004
22-Apr-87	22-Apr-87	14	1.965	3.253	2.739	-0.007	-0.007	-0.006	-0.007
06-May-87	06-May-87	28	1.954	3.243	2.729	-0.010	-0.009	-0.009	-0.009
03-Jun-87	03-Jun-87	56	1.951	3.242	2.728	-0.011	-0.010	-0.009	-0.010
01-Jul-87	01-Jul-87	84	1.955	3.244	2.730	-0.010	-0.009	-0.009	-0.009
29-Jul-87	29-Jul-87	112	1.957	3.247	2.732	-0.009	-0.008	-0.008	-0.009
23-Sep-87	23-Sep-87	168	1.957	3.249	2.736	-0.009	-0.008	-0.007	-0.008
06-Jan-88	06-Jan-88	273	1.989	3.279	2.768	0.000	0.001	0.002	0.001
06-Apr-88	07-Apr-88	364	1.954	3.240	2.727	-0.010	-0.010	-0.010	-0.010
21-Jul-88	21-Jul-88	470	1.976	3.256	2.749	-0.004	-0.006	-0.003	-0.004
05-Oct-88	06-Oct-88	546	1.972	3.260	2.747	-0.005	-0.005	-0.004	-0.004
05-Apr-89	07-Apr-89	728	1.980	3.269	2.757	-0.003	-0.002	-0.001	-0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
09-Apr-87	09-Apr-87	1	2.787	3.357	2.261	0.000	0.000	0.000	0.000
15-Apr-87	15-Apr-87	7	2.771	3.341	2.247	-0.005	-0.005	-0.004	-0.004
22-Apr-87	22-Apr-87	14	2.763	3.333	2.243	-0.007	-0.007	-0.005	-0.006
06-May-87	06-May-87	28	2.757	3.328	2.241	-0.009	-0.008	-0.006	-0.007
03-Jun-87	03-Jun-87	56	2.762	3.328	2.242	-0.007	-0.008	-0.005	-0.007
02-Jul-87	01-Jul-87	85	2.770	3.342	2.248	-0.005	-0.004	-0.004	-0.004
29-Jul-87	29-Jul-87	112	2.766	3.332	2.245	-0.006	-0.007	-0.005	-0.006
23-Sep-87	23-Sep-87	168	2.771	3.343	2.253	-0.005	-0.004	-0.002	-0.004
06-Jan-88	06-Jan-88	273	2.799	3.373	2.284	0.003	0.005	0.007	0.005
06-Apr-88	07-Apr-88	364	2.772	3.373	2.254	-0.004	0.005	-0.002	-0.001
21-Jul-88	21-Jul-88	470	2.788	3.359	2.273	.000	0.001	0.003	0.001
05-Oct-88	06-Oct-88	546	2.791	3.355	2.270	0.001	-0.001	0.003	0.001
05-Apr-89	07-Apr-89	728	2.794	3.365	2.277	0.002	0.002	0.005	0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R8 CSA 23.2-14A

Rock Type: Greywacke

Locality: Springhill

Dates Cast:

			Alk %	Temp C
1A,B,C	08-Apr-87	Bin 9	0.94	23
2A,B,C	08-Apr-87	Box R8-2	0.94	38
3A,B,C	09-Apr-87	Bin 9	1.25	23
4A,B,C	09-Apr-87	Box R8-4	1.25	38

Sample Lengths:

352.806 mm

05-Apr-89	07-Apr-89	728	2.794	3.365	2.277	0.002	0.002	0.005	0.003

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
10-Apr-87	10-Apr-87	1	2.916	2.324	3.322	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	2.924	2.343	3.337	0.002	0.005	0.004	0.004
23-Apr-87	23-Apr-87	14	2.929	2.345	3.340	0.004	0.006	0.005	0.005
07-May-87	07-May-87	28	2.924	2.340	3.335	0.002	0.005	0.004	0.003
04-Jun-87	04-Jun-87	56	2.915	2.328	3.324	.000	0.001	0.001	.000
02-Jul-87	02-Jul-87	84	2.925	2.338	3.336	0.003	0.004	0.004	0.003
30-Jul-87	30-Jul-87	112	2.910	2.323	3.320	-0.002	.000	-0.001	-0.001
24-Sep-87	24-Sep-87	168	2.926	2.334	3.328	0.003	0.003	0.002	0.002
06-Jan-88	07-Jan-88	272	2.961	2.372	3.369	0.013	0.014	0.013	0.013
07-Apr-88	08-Apr-88	364	2.930	2.342	3.339	0.004	0.005	0.005	0.005
22-Jul-88	22-Jul-88	470	2.949	2.359	3.357	0.009	0.010	0.010	0.010
06-Oct-88	07-Oct-88	546	2.932	2.350	3.345	0.005	0.007	0.007	0.006
05-Apr-89	08-Apr-89	727	2.959	2.376	3.372	0.012	0.015	0.014	0.014

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
10-Apr-87	10-Apr-87	1	3.728	2.592	2.703	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	3.739	2.603	2.722	0.003	0.003	0.005	0.004
23-Apr-87	23-Apr-87	14	3.740	2.602	2.718	0.003	0.003	0.004	0.003
07-May-87	07-May-87	28	3.741	2.606	2.718	0.004	0.004	0.004	0.004
04-Jun-87	04-Jun-87	56	3.748	2.609	2.726	0.006	0.005	0.007	0.006
02-Jul-87	02-Jul-87	84	3.761	2.627	2.736	0.009	0.010	0.009	0.010
30-Jul-87	30-Jul-87	112	3.762	2.630	2.740	0.010	0.011	0.010	0.010
24-Sep-87	24-Sep-87	168	3.797	2.687	2.767	0.020	0.027	0.018	0.022
06-Jan-88	07-Jan-88	272	3.939	2.895	2.867	0.060	0.086	0.046	0.064
07-Apr-88	08-Apr-88	364	3.949	2.950	2.873	0.063	0.101	0.048	0.071
22-Jul-88	22-Jul-88	470	3.974	2.993	2.900	0.070	0.114	0.056	0.080
07-Oct-88	07-Oct-88	547	3.980	2.998	2.903	0.071	0.115	0.057	0.081
05-Apr-89	08-Apr-89	727	3.990	3.014	2.910	0.074	0.120	0.059	0.084

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R9 CSA 23.2-14A

Rock Type: Greywacke

Locality: Nigadoo River

Dates Cast:

			Alk %	Temp C
1A,B,C	09-Apr-87	Bin 10	0.94	23
2A,B,C	09-Apr-87	Box R9-2	0.94	38
3A,B,C	09-Apr-87	Bin 10	1.25	23
4A,B,C	09-Apr-87	Box R9-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
10-Apr-87	10-Apr-87	1	2.658	2.625	2.815	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	2.654	2.621	2.809	-0.001	-0.001	-0.002	-0.001
23-Apr-87	23-Apr-87	14	2.651	2.616	2.807	-0.002	-0.003	-0.002	-0.002
07-May-87	07-May-87	28	2.642	2.608	2.798	-0.005	-0.005	-0.005	-0.005
04-Jun-87	04-Jun-87	56	2.634	2.600	2.785	-0.007	-0.007	-0.009	-0.007
02-Jul-87	02-Jul-87	84	2.637	2.600	2.794	-0.006	-0.007	-0.006	-0.006
30-Jul-87	30-Jul-87	112	2.621	2.588	2.775	-0.010	-0.010	-0.011	-0.011
24-Sep-87	24-Sep-87	168	2.641	2.602	2.792	-0.005	-0.007	-0.007	-0.006
07-Jan-88	07-Jan-88	273	2.641	2.610	2.801	-0.005	-0.004	-0.004	-0.004
07-Apr-88	08-Apr-88	364	2.633	2.599	2.786	-0.007	-0.007	-0.008	-0.008
06-Oct-88	07-Oct-88	546	2.646	2.614	2.802	-0.003	-0.003	-0.004	-0.003
06-Apr-89	08-Apr-89	728	2.649	2.614	2.807	-0.003	-0.003	-0.002	-0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
10-Apr-87	10-Apr-87	1	2.109	2.556	2.692	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	2.097	2.536	2.678	-0.003	-0.006	-0.004	-0.004
23-Apr-87	23-Apr-87	14	2.091	2.542	2.680	-0.005	-0.004	-0.003	-0.004
07-May-87	07-May-87	28	2.090	2.543	2.681	-0.005	-0.004	-0.003	-0.004
04-Jun-87	04-Jun-87	56	2.078	2.524	2.665	-0.009	-0.009	-0.008	-0.009
02-Jul-87	02-Jul-87	84	2.088	2.533	2.671	-0.006	-0.007	-0.006	-0.006
30-Jul-87	30-Jul-87	112	2.056	2.513	2.645	-0.015	-0.012	-0.013	-0.014
24-Sep-87	24-Sep-87	168	2.087	2.535	2.671	-0.006	-0.006	-0.006	-0.006
07-Jan-88	07-Jan-88	273	2.096	2.541	2.683	-0.004	-0.004	-0.003	-0.003
07-Apr-88	08-Apr-88	364	2.075	2.525	2.669	-0.010	-0.009	-0.007	-0.008
07-Oct-88	07-Oct-88	547	2.102	2.553	2.696	-0.002	-0.001	0.001	-0.001
05-Apr-89	08-Apr-89	727	2.103	2.552	2.694	-0.002	-0.001	0.001	-0.001

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R9 CSA 23.2-14A

Rock Type: Greywacke

Locality: Nigadoo River

Dates Cast:

			Alk %	Temp C
1A,B,C	09-Apr-87	Bin 10	0.94	23
2A,B,C	09-Apr-87	Box R9-2	0.94	38
3A,B,C	09-Apr-87	Bin 10	1.25	23
4A,B,C	09-Apr-87	Box R9-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
10-Apr-87	10-Apr-87	1	2.042	2.078	2.478	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	2.055	2.088	2.484	0.004	0.003	0.002	0.003
23-Apr-87	23-Apr-87	14	2.057	2.090	2.491	0.004	0.003	0.004	0.004
07-May-87	07-May-87	28	2.047	2.079	2.483	0.001	.000	0.001	0.001
04-Jun-87	04-Jun-87	56	2.039	2.073	2.478	-0.001	-0.001	0.000	-0.001
02-Jul-87	02-Jul-87	84	2.046	2.078	2.485	0.001	0.000	0.002	0.001
30-Jul-87	30-Jul-87	112	2.032	2.063	2.469	-0.003	-0.004	-0.003	-0.003
24-Sep-87	24-Sep-87	168	2.040	2.076	2.480	-0.001	-0.001	0.001	.000
07-Jan-88	07-Jan-88	273	2.051	2.088	2.494	0.003	0.003	0.005	0.003
07-Apr-88	08-Apr-88	364	2.039	2.073	2.481	-0.001	-0.001	0.001	.000
06-Oct-88	07-Oct-88	546	2.055	2.088	2.496	0.004	0.003	0.005	0.004
06-Apr-89	08-Apr-89	728	2.064	2.095	2.502	0.006	0.005	0.007	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
10-Apr-87	10-Apr-87	1	3.123	2.532	2.820	0.000	0.000	0.000	0.000
16-Apr-87	16-Apr-87	7	3.126	2.531	2.822	0.001	.000	0.001	.000
23-Apr-87	23-Apr-87	14	3.129	2.534	2.825	0.002	0.001	0.001	0.001
07-May-87	07-May-87	28	3.128	2.534	2.822	0.001	0.001	0.001	0.001
04-Jun-87	04-Jun-87	56	3.122	2.525	2.813	.000	-0.002	-0.002	-0.001
02-Jul-87	02-Jul-87	84	3.129	2.532	2.820	0.002	0.000	0.000	0.001
30-Jul-87	30-Jul-87	112	3.106	2.503	2.795	-0.005	-0.008	-0.007	-0.007
24-Sep-87	24-Sep-87	168	3.123	2.535	2.818	0.000	0.001	-0.001	.000
07-Jan-88	07-Jan-88	273	3.140	2.546	2.830	0.005	0.004	0.003	0.004
07-Apr-88	08-Apr-88	364	3.128	2.534	2.823	0.001	0.001	0.001	0.001
07-Oct-88	07-Oct-88	547	3.150	2.559	2.842	0.008	0.008	0.006	0.007
05-Apr-89	08-Apr-89	727	3.153	2.562	2.851	0.009	0.009	0.009	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	R10	CSA 23.2-14A
Rock Type:	Quartzite	
Locality:	Mullin Lake Road	

Dates Cast:			Alk %	Temp C
1A,B,C	10-Apr-87	Bin 11	0.94	23
2A,B,C	10-Apr-87	Box R10-2	0.94	38
3A,B,C	10-Apr-87	Bin 11	1.25	23
4A,B,C	10-Apr-87	Box R10-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
11-Apr-87	11-Apr-87	1	3.344	2.327	2.178	0.000	0.000	0.000	0.000
17-Apr-87	17-Apr-87	7	3.338	2.328	2.174	-0.002	.000	-0.001	-0.001
24-Apr-87	24-Apr-87	14	3.350	2.345	2.192	0.002	0.005	0.004	0.004
08-May-87	08-May-87	28	3.337	2.330	2.176	-0.002	0.001	-0.001	-0.001
05-Jun-87	05-Jun-87	56	3.326	2.318	2.165	-0.005	-0.003	-0.004	-0.004
03-Jul-87	03-Jul-87	84	3.306	2.297	2.148	-0.011	-0.009	-0.009	-0.009
31-Jul-87	31-Jul-87	112	3.338	2.332	2.178	-0.002	0.001	0.000	.000
25-Sep-87	25-Sep-87	168	3.324	2.317	2.167	-0.006	-0.003	-0.003	-0.004
08-Jan-88	08-Jan-88	273	3.348	2.340	2.188	0.001	0.004	0.003	0.003
08-Apr-88	09-Apr-88	364	3.328	2.319	2.168	-0.005	-0.002	-0.003	-0.003
07-Oct-88	08-Oct-88	546	3.348	2.337	2.185	0.001	0.003	0.002	0.002
07-Apr-89	09-Apr-89	728	3.349	2.341	2.186	0.001	0.004	0.002	0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
11-Apr-87	11-Apr-87	1	2.802	2.021	2.763	0.000	0.000	0.000	0.000
17-Apr-87	17-Apr-87	7	2.796	2.015	2.760	-0.002	-0.002	-0.001	-0.001
24-Apr-87	24-Apr-87	14	2.812	2.026	2.774	0.003	0.001	0.003	0.002
08-May-87	08-May-87	28	2.795	2.020	2.765	-0.002	.000	0.001	-0.001
05-Jun-87	05-Jun-87	56	2.792	2.013	2.757	-0.003	-0.002	-0.002	-0.002
03-Jul-87	03-Jul-87	84	2.785	2.006	2.751	-0.005	-0.004	-0.003	-0.004
31-Jul-87	31-Jul-87	112	2.796	2.016	2.765	-0.002	-0.001	0.001	-0.001
25-Sep-87	25-Sep-87	168	2.782	2.010	2.755	-0.006	-0.003	-0.002	-0.004
08-Jan-88	08-Jan-88	273	2.797	2.021	2.769	-0.001	0.000	0.002	.000
08-Apr-88	09-Apr-88	364	2.790	2.012	2.759	-0.003	-0.003	-0.001	-0.002
07-Oct-88	08-Oct-88	546	2.809	2.033	2.781	0.002	0.003	0.005	0.003
07-Apr-89	09-Apr-89	728	2.806	2.029	2.781	0.001	0.002	0.005	0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R10 CSA 23.2-14A

Rock Type: Quartzite

Locality: Mullin Lake Road

Dates Cast:

			Alk %	Temp C
1A,B,C	10-Apr-87	Bin 11	0.94	23
2A,B,C	10-Apr-87	Box R10-2	0.94	38
3A,B,C	10-Apr-87	Bin 11	1.25	23
4A,B,C	10-Apr-87	Box R10-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
11-Apr-87	11-Apr-87	1	1.962	2.224	3.449	0.000	0.000	0.000	0.000
17-Apr-87	17-Apr-87	7	1.962	2.225	3.449	0.000	.000	0.000	.000
24-Apr-87	24-Apr-87	14	1.985	2.248	3.468	0.007	0.007	0.005	0.006
08-May-87	08-May-87	28	1.966	2.228	3.451	0.001	0.001	0.001	0.001
05-Jun-87	05-Jun-87	56	1.959	2.225	3.446	-0.001	.000	-0.001	.000
03-Jul-87	03-Jul-87	84	1.945	2.206	3.423	-0.005	-0.005	-0.007	-0.006
31-Jul-87	31-Jul-87	112	1.969	2.232	3.456	0.002	0.002	0.002	0.002
25-Sep-87	25-Sep-87	168	1.962	2.223	3.448	0.000	.000	.000	.000
08-Jan-88	08-Jan-88	273	1.981	2.243	3.464	0.005	0.005	0.004	0.005
08-Apr-88	09-Apr-88	364	1.967	2.226	3.449	0.001	0.001	0.000	0.001
07-Oct-88	08-Oct-88	546	1.976	2.240	3.460	0.004	0.005	0.003	0.004
07-Apr-89	09-Apr-89	728	1.985	2.250	3.470	0.007	0.007	0.006	0.007

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
11-Apr-87	11-Apr-87	1	2.579	3.364	1.928	0.000	0.000	0.000	0.000
17-Apr-87	17-Apr-87	7	2.579	3.364	1.929	0.000	0.000	.000	.000
24-Apr-87	24-Apr-87	14	2.599	3.382	1.950	0.006	0.005	0.006	0.006
08-May-87	08-May-87	28	2.583	3.369	1.934	0.001	0.001	0.002	0.001
05-Jun-87	05-Jun-87	56	2.584	3.370	1.932	0.001	0.002	0.001	0.001
03-Jul-87	03-Jul-87	84	2.580	3.365	1.929	.000	.000	.000	.000
31-Jul-87	31-Jul-87	112	2.588	3.375	1.934	0.003	0.003	0.002	0.002
25-Sep-87	25-Sep-87	168	2.582	3.368	1.927	0.001	0.001	.000	0.001
08-Jan-88	08-Jan-88	273	2.594	3.381	1.944	0.004	0.005	0.005	0.005
08-Apr-88	09-Apr-88	364	2.591	3.382	1.935	0.003	0.005	0.002	0.003
07-Oct-88	08-Oct-88	546	2.611	3.400	1.956	0.009	0.010	0.008	0.009
07-Apr-89	09-Apr-89	728	2.608	3.398	1.958	0.008	0.010	0.009	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R11 CSA 23.2-14A

Rock Type: Quartzite

Locality: St Stephen/Rollingdam

Dates Cast:

			Alk %	Temp C
1A,B,C	13-Apr-87	Bin 12	0.94	23
2A,B,C	13-Apr-87	Box R11-2	0.94	38
3A,B,C	13-Apr-87	Bin 12	1.25	23
4A,B,C	13-Apr-87	Box R11-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
14-Apr-87	14-Apr-87	1	1.615	3.096	2.406	0.000	0.000	0.000	0.000
20-Apr-87	20-Apr-87	7	1.604	3.089	2.403	-0.003	-0.002	-0.001	-0.002
27-Apr-87	27-Apr-87	14	1.610	3.091	2.405	-0.001	-0.001	.000	-0.001
11-May-87	11-May-87	28	1.602	3.084	2.399	-0.004	-0.003	-0.002	-0.003
08-Jun-87	08-Jun-87	56	1.590	3.074	2.389	-0.007	-0.006	-0.005	-0.006
06-Jul-87	06-Jul-87	84	1.594	3.078	2.393	-0.006	-0.005	-0.004	-0.005
03-Aug-87	03-Aug-87	112	1.605	3.080	2.397	-0.003	-0.005	-0.003	-0.003
28-Sep-87	28-Sep-87	168	1.578	3.055	2.369	-0.010	-0.012	-0.010	-0.011
11-Jan-88	11-Jan-88	273	1.592	3.073	2.386	-0.007	-0.007	-0.006	-0.006
11-Apr-88	12-Apr-88	364	1.592	3.082	2.393	-0.007	-0.004	-0.004	-0.005
10-Oct-88	11-Oct-88	546	1.604	3.085	2.402	-0.003	-0.003	-0.001	-0.002
10-Apr-89	12-Apr-89	728	1.611	3.097	2.409	-0.001	.000	0.001	.000

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
14-Apr-87	14-Apr-87	1	2.751	3.249	2.621	0.000	0.000	0.000	0.000
20-Apr-87	20-Apr-87	7	2.741	3.238	2.607	-0.003	-0.003	-0.004	-0.003
27-Apr-87	27-Apr-87	14	2.751	3.247	2.617	0.000	-0.001	-0.001	-0.001
11-May-87	11-May-87	28	2.744	3.243	2.608	-0.002	-0.002	-0.004	-0.002
08-Jun-87	08-Jun-87	56	2.734	3.236	2.607	-0.005	-0.004	-0.004	-0.004
06-Jul-87	06-Jul-87	84	2.736	3.241	2.611	-0.004	-0.002	-0.003	-0.003
03-Aug-87	03-Aug-87	112	2.736	3.236	2.608	-0.004	-0.004	-0.004	-0.004
28-Sep-87	28-Sep-87	168	2.737	3.242	2.613	-0.004	-0.002	-0.002	-0.003
11-Jan-88	11-Jan-88	273	2.713	3.210	2.578	-0.011	-0.011	-0.012	-0.011
11-Apr-88	12-Apr-88	364	2.739	3.236	2.611	-0.003	-0.004	-0.003	-0.003
10-Oct-88	11-Oct-88	546	2.752	3.253	2.623	.000	0.001	0.001	0.001
10-Apr-89	12-Apr-89	728	2.746	3.248	2.623	-0.001	.000	0.001	.000

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R11 CSA 23.2-14A

Rock Type: Quartzite

Locality: St Stephen/Rollingdam

Dates Cast:

			Alk %	Temp C
1A,B,C	13-Apr-87	Bin 12	0.94	23
2A,B,C	13-Apr-87	Box R11-2	0.94	38
3A,B,C	13-Apr-87	Bin 12	1.25	23
4A,B,C	13-Apr-87	Box R11-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
14-Apr-87	14-Apr-87	1	1.810	2.603	2.094	0.000	0.000	0.000	0.000
20-Apr-87	20-Apr-87	7	1.820	2.615	2.102	0.003	0.003	0.002	0.003
27-Apr-87	27-Apr-87	14	1.827	2.623	2.112	0.005	0.006	0.005	0.005
11-May-87	11-May-87	28	1.819	2.616	2.109	0.003	0.004	0.004	0.003
08-Jun-87	08-Jun-87	56	1.815	2.610	2.098	0.001	0.002	0.001	0.002
06-Jul-87	06-Jul-87	84	1.820	2.612	2.104	0.003	0.003	0.003	0.003
03-Aug-87	03-Aug-87	112	1.823	2.619	2.100	0.004	0.005	0.002	0.003
28-Sep-87	28-Sep-87	168	1.794	2.592	2.083	-0.005	-0.003	-0.003	-0.004
11-Jan-88	11-Jan-88	273	1.811	2.607	2.095	.000	0.001	.000	0.001
11-Apr-88	12-Apr-88	364	1.821	2.619	2.111	0.003	0.005	0.005	0.004
10-Oct-88	11-Oct-88	546	1.827	2.627	2.114	0.005	0.007	0.006	0.006
10-Apr-89	12-Apr-89	728	1.832	2.628	2.118	0.006	0.007	0.007	0.007

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
14-Apr-87	14-Apr-87	1	3.732	2.250	2.556	0.000	0.000	0.000	0.000
20-Apr-87	20-Apr-87	7	3.745	2.276	2.574	0.004	0.007	0.005	0.005
27-Apr-87	27-Apr-87	14	3.754	2.282	2.585	0.006	0.009	0.008	0.008
11-May-87	11-May-87	28	3.741	2.268	2.570	0.003	0.005	0.004	0.004
08-Jun-87	08-Jun-87	56	3.743	2.271	2.571	0.003	0.006	0.004	0.004
06-Jul-87	06-Jul-87	84	3.748	2.273	2.578	0.005	0.007	0.006	0.006
03-Aug-87	03-Aug-87	112	3.752	2.274	2.580	0.006	0.007	0.007	0.006
28-Sep-87	28-Sep-87	168	3.753	2.276	2.583	0.006	0.007	0.008	0.007
11-Jan-88	11-Jan-88	273	3.720	2.250	2.554	-0.003	0.000	-0.001	-0.001
11-Apr-88	12-Apr-88	364	3.749	2.277	2.576	0.005	0.008	0.006	0.006
10-Oct-88	11-Oct-88	546	3.760	2.292	2.587	0.008	0.012	0.009	0.010
10-Apr-89	12-Apr-89	728	3.763	2.292	2.592	0.009	0.012	0.010	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R12 CSA 23.2-14A

Rock Type: Silicified Volcanic

Locality: Jacquet River

Dates Cast:

			Alk %	Temp C
1A,B,C	14-Apr-87	Bin 13	0.94	23
2A,B,C	14-Apr-87	Box R12-2	0.94	38
3A,B,C	14-Apr-87	Bin 13	1.25	23
4A,B,C	14-Apr-87	Box R12-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
15-Apr-87	15-Apr-87	1	3.115	2.955	2.723	0.000	0.000	0.000	0.000
21-Apr-87	21-Apr-87	7	3.109	2.946	2.713	-0.002	-0.003	-0.003	-0.002
28-Apr-87	28-Apr-87	14	3.119	2.957	2.725	0.001	0.001	0.001	0.001
12-May-87	12-May-87	28	3.100	2.940	2.709	-0.004	-0.004	-0.004	-0.004
09-Jun-87	09-Jun-87	56	3.098	2.935	2.704	-0.005	-0.006	-0.005	-0.005
07-Jul-87	07-Jul-87	84	3.097	2.935	2.699	-0.005	-0.006	-0.007	-0.006
04-Aug-87	04-Aug-87	112	3.102	2.937	2.704	-0.004	-0.005	-0.005	-0.005
29-Sep-87	29-Sep-87	168	3.094	2.924	2.689	-0.006	-0.009	-0.010	-0.008
12-Jan-88	12-Jan-88	273	3.108	2.943	2.708	-0.002	-0.003	-0.004	-0.003
12-Apr-88	13-Apr-88	364	3.100	2.944	2.703	-0.004	-0.003	-0.006	-0.004
11-Oct-88	12-Oct-88	546	3.114	2.956	2.717	.000	.000	-0.002	-0.001
11-Apr-89	13-Apr-89	728	3.097	2.937	2.701	-0.005	-0.005	-0.006	-0.005

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
15-Apr-87	15-Apr-87	1	2.826	3.479	3.643	0.000	0.000	0.000	0.000
21-Apr-87	21-Apr-87	7	2.805	3.460	3.626	-0.006	-0.005	-0.005	-0.005
28-Apr-87	28-Apr-87	14	2.814	3.470	3.634	-0.003	-0.003	-0.003	-0.003
12-May-87	12-May-87	28	2.806	3.462	3.625	-0.006	-0.005	-0.005	-0.005
09-Jun-87	09-Jun-87	56	2.803	3.459	3.625	-0.007	-0.006	-0.005	-0.006
07-Jul-87	07-Jul-87	84	2.796	3.450	3.619	-0.009	-0.008	-0.007	-0.008
04-Aug-87	04-Aug-87	112	2.793	3.453	3.620	-0.009	-0.007	-0.007	-0.008
29-Sep-87	29-Sep-87	168	2.784	3.450	3.613	-0.012	-0.008	-0.009	-0.010
12-Jan-88	12-Jan-88	273	2.808	3.466	3.633	-0.005	-0.004	-0.003	-0.004
12-Apr-88	13-Apr-88	364	2.805	3.465	3.627	-0.006	-0.004	-0.005	-0.005
11-Oct-88	12-Oct-88	546	2.822	3.488	3.645	-0.001	0.003	0.001	0.001
11-Apr-89	13-Apr-89	728	2.810	3.466	3.637	-0.005	-0.004	-0.002	-0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R12 CSA 23.2-14A

Rock Type: Silicified Volcanic

Locality: Jacquet River

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	14-Apr-87	Bin 13	0.94	23	
2A,B,C	14-Apr-87	Box R12-2	0.94	38	
3A,B,C	14-Apr-87	Bin 13	1.25	23	352.806 mm
4A,B,C	14-Apr-87	Box R12-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
15-Apr-87	15-Apr-87	1	2.896	2.759	2.652	0.000	0.000	0.000	0.000
21-Apr-87	21-Apr-87	7	2.900	2.763	2.650	0.001	0.001	-0.001	0.001
28-Apr-87	28-Apr-87	14	2.911	2.775	2.665	0.004	0.005	0.004	0.004
12-May-87	12-May-87	28	2.900	2.760	2.647	0.001	.000	-0.001	.000
09-Jun-87	09-Jun-87	56	2.902	2.763	2.655	0.002	0.001	0.001	0.001
07-Jul-87	07-Jul-87	84	2.898	2.758	2.649	0.001	.000	-0.001	.000
04-Aug-87	04-Aug-87	112	2.898	2.762	2.653	0.001	0.001	.000	0.001
29-Sep-87	29-Sep-87	168	2.875	2.742	2.635	-0.006	-0.005	-0.005	-0.005
12-Jan-88	12-Jan-88	273	2.901	2.767	2.656	0.001	0.002	0.001	0.002
12-Apr-88	13-Apr-88	364	2.901	2.762	2.656	0.001	0.001	0.001	0.001
11-Oct-88	12-Oct-88	546	2.917	2.776	2.666	0.006	0.005	0.004	0.005
11-Apr-89	13-Apr-89	728	2.900	2.761	2.651	0.001	0.001	.000	.000

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
15-Apr-87	15-Apr-87	1	2.495	1.721	2.275	0.000	0.000	0.000	0.000
21-Apr-87	21-Apr-87	7	2.483	1.713	2.274	-0.003	-0.002	.000	-0.002
28-Apr-87	28-Apr-87	14	2.512	1.736	2.290	0.005	0.004	0.004	0.004
12-May-87	12-May-87	28	2.498	1.724	2.279	0.001	0.001	0.001	0.001
09-Jun-87	09-Jun-87	56	2.494	1.723	2.276	.000	0.001	.000	.000
07-Jul-87	07-Jul-87	84	2.493	1.723	2.276	-0.001	0.001	.000	.000
04-Aug-87	04-Aug-87	112	2.485	1.715	2.272	-0.003	-0.002	-0.001	-0.002
29-Sep-87	29-Sep-87	168	2.478	1.706	2.259	-0.005	-0.004	-0.005	-0.005
12-Jan-88	12-Jan-88	273	2.506	1.734	2.285	0.003	0.004	0.003	0.003
12-Apr-88	13-Apr-88	364	2.502	1.732	2.280	0.002	0.003	0.001	0.002
11-Oct-88	12-Oct-88	546	2.518	1.744	2.298	0.007	0.007	0.007	0.007
11-Apr-89	13-Apr-89	728	2.500	1.728	2.280	0.001	0.002	0.001	0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R13 CSA 23.2-14A

Rock Type: Microphyric Rhyolite

Locality: Highway 430/Tomogomops L.

Dates Cast:			Alk %	Temp C
1A,B,C	15-Apr-87	Bin 14	0.94	23
2A,B,C	15-Apr-87	Box R13-2	0.94	38
3A,B,C	15-Apr-87	Bin 14	1.25	23
4A,B,C	15-Apr-87	Box R13-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
16-Apr-87	16-Apr-87	1	2.847	2.839	1.757	0.000	0.000	0.000	0.000
22-Apr-87	22-Apr-87	7	2.844	2.836	1.752	-0.001	-0.001	-0.001	-0.001
29-Apr-87	29-Apr-87	14	2.847	2.838	1.756	0.000	.000	.000	.000
13-May-87	13-May-87	28	2.830	2.824	1.740	-0.005	-0.004	-0.005	-0.005
10-Jun-87	10-Jun-87	56	2.833	2.862	1.744	-0.004	0.007	-0.004	.000
08-Jul-87	08-Jul-87	84	2.827	2.819	1.733	-0.006	-0.006	-0.007	-0.006
05-Aug-87	05-Aug-87	112	2.834	2.828	1.739	-0.004	-0.003	-0.005	-0.004
30-Sep-87	30-Sep-87	168	2.831	2.823	1.738	-0.005	-0.005	-0.005	-0.005
13-Jan-88	13-Jan-88	273	2.834	2.824	1.740	-0.004	-0.004	-0.005	-0.004
13-Apr-88	14-Apr-88	364	2.833	2.828	1.738	-0.004	-0.003	-0.005	-0.004
12-Oct-88	13-Oct-88	546	2.845	2.837	1.750	-0.001	-0.001	-0.002	-0.001
12-Apr-89	14-Apr-89	728	2.843	2.835	1.750	-0.001	-0.001	-0.002	-0.001

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
16-Apr-87	16-Apr-87	1	1.838	2.991	2.331	0.000	0.000	0.000	0.000
22-Apr-87	22-Apr-87	7	1.828	2.982	2.325	-0.003	-0.003	-0.002	-0.002
29-Apr-87	29-Apr-87	14	1.831	2.987	2.330	-0.002	-0.001	.000	-0.001
13-May-87	13-May-87	28	1.825	2.984	2.320	-0.004	-0.002	-0.003	-0.003
10-Jun-87	10-Jun-87	56	1.832	2.979	2.322	-0.002	-0.003	-0.003	-0.003
08-Jul-87	08-Jul-87	84	1.819	2.975	2.319	-0.005	-0.005	-0.003	-0.004
05-Aug-87	05-Aug-87	112	1.826	2.986	2.325	-0.003	-0.001	-0.002	-0.002
30-Sep-87	30-Sep-87	168	1.822	2.794	2.318	-0.005	-0.056	-0.004	-0.021
13-Jan-88	13-Jan-88	273	1.826	2.983	2.328	-0.003	-0.002	-0.001	-0.002
13-Apr-88	14-Apr-88	364	1.826	2.980	2.321	-0.003	-0.003	-0.003	-0.003
12-Oct-88	13-Oct-88	546	1.842	3.001	2.340	0.001	0.003	0.003	0.002
12-Apr-89	14-Apr-89	728	1.837	2.999	2.333	.000	0.002	0.001	0.001

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R13 CSA 23.2-14A

Rock Type: Microphyric Rhyolite

Locality: Highway 430/Tomogomops L.

Dates Cast:

			Alk %	Temp C
1A,B,C	15-Apr-87	Bin 14	0.94	23
2A,B,C	15-Apr-87	Box R13-2	0.94	38
3A,B,C	15-Apr-87	Bin 14	1.25	23
4A,B,C	15-Apr-87	Box R13-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
16-Apr-87	16-Apr-87	1	2.816	2.760	1.960	0.000	0.000	0.000	0.000
22-Apr-87	22-Apr-87	7	2.831	2.773	1.969	0.004	0.004	0.003	0.003
29-Apr-87	29-Apr-87	14	2.833	2.777	1.973	0.005	0.005	0.004	0.004
13-May-87	13-May-87	28	2.826	2.770	1.965	0.003	0.003	0.001	0.002
10-Jun-87	10-Jun-87	56	2.826	2.772	1.967	0.003	0.003	0.002	0.003
08-Jul-87	08-Jul-87	84	2.821	2.767	1.963	0.001	0.002	0.001	0.001
05-Aug-87	05-Aug-87	112	2.824	2.770	1.961	0.002	0.003	.000	0.002
30-Sep-87	30-Sep-87	168	2.825	2.771	1.963	0.003	0.003	0.001	0.002
13-Jan-88	13-Jan-88	273	2.827	2.778	1.968	0.003	0.005	0.002	0.003
13-Apr-88	14-Apr-88	364	2.830	2.774	1.972	0.004	0.004	0.003	0.004
12-Oct-88	13-Oct-88	546	2.844	2.784	1.982	0.008	0.007	0.006	0.007
12-Apr-89	14-Apr-89	728	2.841	2.784	1.979	0.007	0.007	0.005	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
16-Apr-87	16-Apr-87	1	2.090	2.579	1.911	0.000	0.000	0.000	0.000
22-Apr-87	22-Apr-87	7	2.095	2.583	1.918	0.001	0.001	0.002	0.002
29-Apr-87	29-Apr-87	14	2.099	2.589	1.924	0.003	0.003	0.004	0.003
13-May-87	13-May-87	28	2.099	2.589	1.925	0.003	0.003	0.004	0.003
10-Jun-87	10-Jun-87	56	2.091	2.579	1.911	.000	0.000	0.000	.000
08-Jul-87	08-Jul-87	84	2.092	2.581	1.916	0.001	0.001	0.001	0.001
05-Aug-87	05-Aug-87	112	2.099	2.590	1.925	0.003	0.003	0.004	0.003
30-Sep-87	30-Sep-87	168	2.096	2.589	1.918	0.002	0.003	0.002	0.002
13-Jan-88	13-Jan-88	273	2.107	2.600	1.932	0.005	0.006	0.006	0.006
13-Apr-88	14-Apr-88	364	2.109	2.604	1.930	0.005	0.007	0.005	0.006
12-Oct-88	13-Oct-88	546	2.122	2.620	1.949	0.009	0.012	0.011	0.010
13-Apr-89	14-Apr-89	729	2.117	2.614	1.937	0.008	0.010	0.007	0.008

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R14 CSA 23.2-14A

Rock Type: Rhyolitic Tuff

Locality: Mount Pleasant

	Dates Cast:		Alk %	Temp C
1A,B,C	16-Apr-87	Bin 15	0.94	23
2A,B,C	16-Apr-87	Box R14-2	0.94	38
3A,B,C	16-Apr-87	Bin 15	1.25	23
4A,B,C	16-Apr-87	Box R14-4	1.25	38

Sample
Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
17-Apr-87	17-Apr-87	1	2.048	2.729	2.111	0.000	0.000	0.000	0.000
23-Apr-87	23-Apr-87	7	2.047	2.720	2.108	.000	-0.003	-0.001	-0.001
30-Apr-87	30-Apr-87	14	2.057	2.733	2.112	0.003	0.001	.000	0.001
14-May-87	14-May-87	28	2.027	2.702	2.086	-0.006	-0.008	-0.007	-0.007
11-Jun-87	11-Jun-87	56	2.034	2.704	2.090	-0.004	-0.007	-0.006	-0.006
09-Jul-87	09-Jul-87	84	2.019	2.699	2.080	-0.008	-0.009	-0.009	-0.009
06-Aug-87	06-Aug-87	112	2.028	2.707	2.090	-0.006	-0.006	-0.006	-0.006
01-Oct-87	01-Oct-87	168	2.024	2.703	2.088	-0.007	-0.007	-0.007	-0.007
14-Jan-88	14-Jan-88	273	2.040	2.716	2.100	-0.002	-0.004	-0.003	-0.003
14-Apr-88	15-Apr-88	364	2.047	2.719	2.106	.000	-0.003	-0.001	-0.002
13-Oct-88	14-Oct-88	546	2.048	2.722	2.105	0.000	-0.002	-0.002	-0.001
13-Apr-89	15-Apr-89	728	2.040	2.718	2.100	-0.002	-0.003	-0.003	-0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
17-Apr-87	17-Apr-87	1	2.405	2.180	2.725	0.000	0.000	0.000	0.000
23-Apr-87	23-Apr-87	7	2.384	2.162	2.710	-0.006	-0.005	-0.004	-0.005
30-Apr-87	30-Apr-87	14	2.394	2.167	2.722	-0.003	-0.004	-0.001	-0.003
14-May-87	14-May-87	28	2.380	2.161	2.708	-0.007	-0.005	-0.005	-0.006
11-Jun-87	11-Jun-87	56	2.384	2.162	2.705	-0.006	-0.005	-0.006	-0.006
09-Jul-87	09-Jul-87	84	2.379	2.152	2.697	-0.007	-0.008	-0.008	-0.008
06-Aug-87	06-Aug-87	112	2.384	2.158	2.708	-0.006	-0.006	-0.005	-0.006
01-Oct-87	01-Oct-87	168	2.378	2.153	2.703	-0.008	-0.008	-0.006	-0.007
14-Jan-88	14-Jan-88	273	2.391	2.168	2.718	-0.004	-0.003	-0.002	-0.003
14-Apr-88	15-Apr-88	364	2.402	2.179	2.721	-0.001	.000	-0.001	-0.001
13-Oct-88	14-Oct-88	546	2.404	2.178	2.729	.000	-0.001	0.001	.000
17-Apr-89	15-Apr-89	732	2.410	2.187	2.736	0.001	0.002	0.003	0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R14 CSA 23.2-14A

Rock Type: Rhyolitic Tuff

Locality: Mount Pleasant

Dates Cast:

			Alk %	Temp C
1A,B,C	16-Apr-87	Bin 15	0.94	23
2A,B,C	16-Apr-87	Box R14-2	0.94	38
3A,B,C	16-Apr-87	Bin 15	1.25	23
4A,B,C	16-Apr-87	Box R14-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
17-Apr-87	17-Apr-87	1	2.775	2.732	2.814	0.000	0.000	0.000	0.000
23-Apr-87	23-Apr-87	7	2.775	2.732	2.815	0.000	0.000	.000	.000
30-Apr-87	30-Apr-87	14	2.780	2.740	2.825	0.001	0.002	0.003	0.002
14-May-87	14-May-87	28	2.760	2.720	2.801	-0.004	-0.003	-0.004	-0.004
11-Jun-87	11-Jun-87	56	2.763	2.723	2.805	-0.003	-0.003	-0.003	-0.003
09-Jul-87	09-Jul-87	84	2.758	2.717	2.801	-0.005	-0.004	-0.004	-0.004
06-Aug-87	06-Aug-87	112	2.766	2.722	2.807	-0.003	-0.003	-0.002	-0.002
01-Oct-87	01-Oct-87	168	2.758	2.721	2.802	-0.005	-0.003	-0.003	-0.004
14-Jan-88	14-Jan-88	273	2.777	2.733	2.818	0.001	.000	0.001	0.001
14-Apr-88	15-Apr-88	364	2.788	2.737	2.821	0.004	0.001	0.002	0.002
13-Oct-88	14-Oct-88	546	2.784	2.735	2.820	0.003	0.001	0.002	0.002
13-Apr-89	15-Apr-89	728	2.781	2.734	2.821	0.002	0.001	0.002	0.001

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
17-Apr-87	17-Apr-87	1	2.033	2.907	2.139	0.000	0.000	0.000	0.000
23-Apr-87	23-Apr-87	7	2.032	2.903	2.136	.000	-0.001	-0.001	-0.001
30-Apr-87	30-Apr-87	14	2.039	2.912	2.145	0.002	0.001	0.002	0.002
14-May-87	14-May-87	28	2.024	2.896	2.127	-0.003	-0.003	-0.003	-0.003
11-Jun-87	11-Jun-87	56	2.026	2.897	2.130	-0.002	-0.003	-0.003	-0.002
09-Jul-87	09-Jul-87	84	2.021	2.894	2.130	-0.003	-0.004	-0.003	-0.003
06-Aug-87	06-Aug-87	112	2.022	2.898	2.130	-0.003	-0.003	-0.003	-0.003
01-Oct-87	01-Oct-87	168	2.020	2.890	2.122	-0.004	-0.005	-0.005	-0.004
14-Jan-88	14-Jan-88	273	2.035	2.907	2.129	0.001	0.000	-0.003	-0.001
14-Apr-88	15-Apr-88	364	2.046	2.918	2.146	0.004	0.003	0.002	0.003
13-Oct-88	14-Oct-88	546	2.052	2.925	2.151	0.005	0.005	0.003	0.005
17-Apr-89	15-Apr-89	732	2.050	2.923	2.156	0.005	0.005	0.005	0.005

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R15 CSA 23.2-14A

Rock Type: Rhyolitic Lava

Locality: Bethel

Dates Cast:

			Alk %	Temp C
1A,B,C	20-Apr-87	Bin 16	0.94	23
2A,B,C	20-Apr-87	Box R15-2	0.94	38
3A,B,C	20-Apr-87	Bin 16	1.25	23
4A,B,C	20-Apr-87	Box R15-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
21-Apr-87	21-Apr-87	1	2.795	2.582	3.429	0.000	0.000	0.000	0.000
27-Apr-87	27-Apr-87	7	2.806	2.587	3.437	0.003	0.001	0.002	0.002
04-May-87	04-May-87	14	2.787	2.571	3.424	-0.002	-0.003	-0.001	-0.002
18-May-87	18-May-87	28	2.787	2.571	3.415	-0.002	-0.003	-0.004	-0.003
15-Jun-87	15-Jun-87	56	2.795	2.577	3.423	0.000	-0.001	-0.002	-0.001
13-Jul-87	13-Jul-87	84	2.790	2.577	3.422	-0.001	-0.001	-0.002	-0.002
10-Aug-87	10-Aug-87	112	2.797	2.577	3.423	0.001	-0.001	-0.002	-0.001
05-Oct-87	05-Oct-87	168	2.797	2.580	3.429	0.001	-0.001	0.000	.000
18-Jan-88	18-Jan-88	273	2.789	2.568	3.419	-0.002	-0.004	-0.003	-0.003
18-Apr-88	19-Apr-88	364	2.791	2.574	3.419	-0.001	-0.002	-0.003	-0.002
17-Oct-88	18-Oct-88	546	2.807	2.587	3.437	0.003	0.001	0.002	0.002
17-Apr-89	19-Apr-89	728	2.805	2.591	3.438	0.003	0.003	0.003	0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
21-Apr-87	21-Apr-87	1	2.814	3.689	3.766	0.000	0.000	0.000	0.000
27-Apr-87	27-Apr-87	7	2.809	3.685	3.762	-0.001	-0.001	-0.001	-0.001
04-May-87	04-May-87	14	2.807	3.683	3.755	-0.002	-0.002	-0.003	-0.002
18-May-87	18-May-87	28	2.805	3.680	3.758	-0.003	-0.003	-0.002	-0.002
15-Jun-87	15-Jun-87	56	2.807	3.687	3.761	-0.002	-0.001	-0.001	-0.001
13-Jul-87	13-Jul-87	84	2.800	3.676	3.753	-0.004	-0.004	-0.004	-0.004
10-Aug-87	10-Aug-87	112	2.793	3.670	3.744	-0.006	-0.005	-0.006	-0.006
05-Oct-87	05-Oct-87	168	2.814	3.694	3.771	0.000	0.001	0.001	0.001
18-Jan-88	18-Jan-88	273	2.810	3.686	3.761	-0.001	-0.001	-0.001	-0.001
18-Apr-88	19-Apr-88	364	2.806	3.683	3.763	-0.002	-0.002	-0.001	-0.002
17-Oct-88	18-Oct-88	546	2.825	3.704	3.782	0.003	0.004	0.005	0.004
17-Apr-89	19-Apr-89	728	2.834	3.709	3.782	0.006	0.006	0.005	0.005

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	R15 CSA 23.2-14A
Rock Type:	Rhyolitic Lava
Locality:	Bethel

Dates Cast:

			Alk %	Temp C
1A,B,C	20-Apr-87	Bin 16	0.94	23
2A,B,C	20-Apr-87	Box R15-2	0.94	38
3A,B,C	20-Apr-87	Bin 16	1.25	23
4A,B,C	20-Apr-87	Box R15-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
21-Apr-87	21-Apr-87	1	2.385	3.593	1.969	0.000	0.000	0.000	0.000
27-Apr-87	27-Apr-87	7	2.413	3.616	1.989	0.008	0.007	0.006	0.007
04-May-87	04-May-87	14	2.402	3.607	1.981	0.005	0.004	0.003	0.004
18-May-87	18-May-87	28	2.395	3.600	1.976	0.003	0.002	0.002	0.002
15-Jun-87	15-Jun-87	56	2.404	3.609	1.986	0.005	0.005	0.005	0.005
13-Jul-87	13-Jul-87	84	2.405	3.609	1.988	0.006	0.005	0.005	0.005
10-Aug-87	10-Aug-87	112	2.403	3.609	1.985	0.005	0.005	0.005	0.005
05-Oct-87	05-Oct-87	168	2.410	3.614	1.989	0.007	0.006	0.006	0.006
18-Jan-88	18-Jan-88	273	2.401	3.603	1.978	0.005	0.003	0.003	0.003
18-Apr-88	19-Apr-88	364	2.407	3.609	1.988	0.006	0.005	0.005	0.005
17-Oct-88	18-Oct-88	546	2.420	3.621	1.998	0.010	0.008	0.008	0.009
17-Apr-89	19-Apr-89	728	2.422	3.626	2.003	0.010	0.009	0.010	0.010

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
21-Apr-87	21-Apr-87	1	3.170	2.028	2.644	0.000	0.000	0.000	0.000
27-Apr-87	27-Apr-87	7	3.181	2.047	2.664	0.003	0.005	0.006	0.005
04-May-87	04-May-87	14	3.180	2.045	2.663	0.003	0.005	0.005	0.004
18-May-87	18-May-87	28	3.177	2.041	2.659	0.002	0.004	0.004	0.003
15-Jun-87	15-Jun-87	56	3.184	2.045	2.661	0.004	0.005	0.005	0.005
13-Jul-87	13-Jul-87	84	3.173	2.038	2.658	0.001	0.003	0.004	0.003
10-Aug-87	10-Aug-87	112	3.172	2.036	2.651	0.001	0.002	0.002	0.002
05-Oct-87	05-Oct-87	168	3.184	2.052	2.673	0.004	0.007	0.008	0.006
18-Jan-88	18-Jan-88	273	3.180	2.048	2.668	0.003	0.006	0.007	0.005
18-Apr-88	19-Apr-88	364	3.182	2.048	2.671	0.003	0.006	0.008	0.006
17-Oct-88	18-Oct-88	546	3.198	2.065	2.685	0.008	0.010	0.012	0.010
17-Apr-89	19-Apr-89	728	3.208	2.076	2.691	0.011	0.014	0.013	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R16 CSA 23.2-14A

Rock Type: Silicic Lava

Locality: Digdeguash

	Dates Cast:		Alk %	Temp C
1A,B,C	21-Apr-87	Bin 17	0.94	23
2A,B,C	21-Apr-87	Box R16-2	0.94	38
3A,B,C	21-Apr-87	Bin 17	1.25	23
4A,B,C	21-Apr-87	Box R16-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
22-Apr-87	22-Apr-87	1	2.688	2.153	2.826	0.000	0.000	0.000	0.000
28-Apr-87	28-Apr-87	7	2.701	2.165	2.835	0.004	0.003	0.003	0.003
05-May-87	05-May-87	14	2.691	2.150	2.823	0.001	-0.001	-0.001	.000
19-May-87	19-May-87	28	2.677	2.143	2.814	-0.003	-0.003	-0.003	-0.003
16-Jun-87	16-Jun-87	56	2.686	2.150	2.818	-0.001	-0.001	-0.002	-0.001
14-Jul-87	14-Jul-87	84	2.683	2.144	2.813	-0.001	-0.003	-0.004	-0.003
11-Aug-87	11-Aug-87	112	2.666	2.130	2.800	-0.006	-0.007	-0.007	-0.007
06-Oct-87	06-Oct-87	168	2.681	2.144	2.818	-0.002	-0.003	-0.002	-0.002
19-Jan-88	19-Jan-88	273	2.677	2.140	2.809	-0.003	-0.004	-0.005	-0.004
19-Apr-88	20-Apr-88	364	2.680	2.144	2.818	-0.002	-0.003	-0.002	-0.002
18-Oct-88	19-Oct-88	546	2.698	2.161	2.831	0.003	0.002	0.001	0.002
18-Apr-89	20-Apr-89	728	2.708	2.170	2.842	0.006	0.005	0.005	0.005

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
22-Apr-87	22-Apr-87	1	2.518	2.688	3.169	0.000	0.000	0.000	0.000
28-Apr-87	28-Apr-87	7	2.524	2.692	3.176	0.002	0.001	0.002	0.002
05-May-87	05-May-87	14	2.509	2.681	3.159	-0.003	-0.002	-0.003	-0.002
19-May-87	19-May-87	28	2.502	2.680	3.155	-0.005	-0.002	-0.004	-0.004
16-Jun-87	16-Jun-87	56	2.508	2.683	3.159	-0.003	-0.001	-0.003	-0.002
14-Jul-87	14-Jul-87	84	2.510	2.684	3.158	-0.002	-0.001	-0.003	-0.002
11-Aug-87	11-Aug-87	112	2.504	2.677	3.155	-0.004	-0.003	-0.004	-0.004
06-Oct-87	06-Oct-87	168	2.512	2.684	3.158	-0.002	-0.001	-0.003	-0.002
19-Jan-88	19-Jan-88	273	2.510	2.685	3.165	-0.002	-0.001	-0.001	-0.001
19-Apr-88	20-Apr-88	364	2.506	2.682	3.159	-0.003	-0.002	-0.003	-0.003
18-Oct-88	19-Oct-88	546	2.526	2.702	3.180	0.002	0.004	0.003	0.003
18-Apr-89	20-Apr-89	728	2.531	2.704	3.185	0.004	0.005	0.005	0.004

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R16 CSA 23.2-14A

Rock Type: Silicic Lava

Locality: Digdeguash

Dates Cast:			Alk %	Temp C	
1A,B,C	21-Apr-87	Bin 17	0.94	23	Sample Lengths:
2A,B,C	21-Apr-87	Box R16-2	0.94	38	
3A,B,C	21-Apr-87	Bin 17	1.25	23	352.806 mm
4A,B,C	21-Apr-87	Box R16-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
22-Apr-87	22-Apr-87	1	2.790	2.793	2.944	0.000	0.000	0.000	0.000
28-Apr-87	28-Apr-87	7	2.812	2.818	2.968	0.006	0.007	0.007	0.007
05-May-87	05-May-87	14	2.800	2.805	2.952	0.003	0.003	0.002	0.003
19-May-87	19-May-87	28	2.794	2.799	2.949	0.001	0.002	0.001	0.001
16-Jun-87	16-Jun-87	56	2.800	2.802	2.954	0.003	0.003	0.003	0.003
14-Jul-87	14-Jul-87	84	2.798	2.797	2.956	0.002	0.001	0.003	0.002
11-Aug-87	11-Aug-87	112	2.777	2.780	2.934	-0.004	-0.004	-0.003	-0.003
06-Oct-87	06-Oct-87	168	2.796	2.802	2.956	0.002	0.003	0.003	0.003
19-Jan-88	19-Jan-88	273	2.800	2.799	2.949	0.003	0.002	0.001	0.002
19-Apr-88	20-Apr-88	364	2.798	2.799	2.951	0.002	0.002	0.002	0.002
18-Oct-88	19-Oct-88	546	2.820	2.822	2.970	0.009	0.008	0.007	0.008
18-Apr-89	20-Apr-89	728	2.829	2.831	2.974	0.011	0.011	0.009	0.010

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
22-Apr-87	22-Apr-87	1	2.793	2.757	2.621	0.000	0.000	0.000	0.000
28-Apr-87	28-Apr-87	7	2.817	2.774	2.646	0.007	0.005	0.007	0.006
05-May-87	05-May-87	14	2.797	2.759	2.626	0.001	0.001	0.001	0.001
19-May-87	19-May-87	28	2.795	2.754	2.635	0.001	-0.001	0.004	0.001
16-Jun-87	16-Jun-87	56	2.799	2.763	2.658	0.002	0.002	0.010	0.005
14-Jul-87	14-Jul-87	84	2.801	2.761	2.659	0.002	0.001	0.011	0.005
11-Aug-87	11-Aug-87	112	2.794	2.758	2.656	.000	.000	0.010	0.003
06-Oct-87	06-Oct-87	168	2.802	2.762	2.677	0.003	0.001	0.016	0.007
19-Jan-88	19-Jan-88	273	2.806	2.765	2.678	0.004	0.002	0.016	0.007
19-Apr-88	20-Apr-88	364	2.808	2.771	2.670	0.004	0.004	0.014	0.007
18-Oct-88	19-Oct-88	546	2.823	2.785	2.703	0.009	0.008	0.023	0.013
18-Apr-89	20-Apr-89	728	2.829	2.787	2.702	0.010	0.009	0.023	0.014

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	R17	CSA 23.2-14A
Rock Type:	Granite	
Locality:	Bartlett's Mills	

Dates Cast:

			'Alk %	Temp C	Sample Lengths:
1A,B,C	22-Apr-87	Bin 18	0.94	23	
2A,B,C	22-Apr-87	Box R17-2	0.94	38	
3A,B,C	22-Apr-87	Bin 18	1.25	23	352.806 mm
4A,B,C	22-Apr-87	Box R17-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
23-Apr-87	23-Apr-87	1	2.024	2.819	2.590	0.000	0.000	0.000	0.000
29-Apr-87	29-Apr-87	7	2.022	2.818	2.595	-0.001	.000	0.001	.000
06-May-87	06-May-87	14	2.005	2.800	2.579	-0.005	-0.005	-0.003	-0.005
20-May-87	20-May-87	28	2.005	2.800	2.578	-0.005	-0.005	-0.003	-0.005
17-Jun-87	17-Jun-87	56	2.007	2.802	2.581	-0.005	-0.005	-0.003	-0.004
15-Jul-87	15-Jul-87	84	2.023	2.819	2.595	.000	0.000	0.001	.000
12-Aug-87	12-Aug-87	112	1.990	2.787	2.570	-0.010	-0.009	-0.006	-0.008
07-Oct-87	07-Oct-87	168	2.009	2.803	2.583	-0.004	-0.005	-0.002	-0.004
20-Jan-88	20-Jan-88	273	2.015	2.807	2.589	-0.003	-0.003	.000	-0.002
20-Apr-88	21-Apr-88	364	2.011	2.802	2.588	-0.004	-0.005	-0.001	-0.003
19-Oct-88	20-Oct-88	546	2.025	2.821	2.594	.000	0.001	0.001	0.001
19-Apr-89	21-Apr-89	728	2.034	2.828	2.610	0.003	0.003	0.006	0.004

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
23-Apr-87	23-Apr-87	1	2.632	2.843	2.611	0.000	0.000	0.000	0.000
29-Apr-87	29-Apr-87	7	2.625	2.834	2.603	-0.002	-0.003	-0.002	-0.002
06-May-87	06-May-87	14	2.621	2.833	2.603	-0.003	-0.003	-0.002	-0.003
20-May-87	20-May-87	28	2.612	2.827	2.598	-0.006	-0.005	-0.004	-0.005
17-Jun-87	17-Jun-87	56	2.615	2.828	2.598	-0.005	-0.004	-0.004	-0.004
15-Jul-87	15-Jul-87	84	2.623	2.840	2.609	-0.003	-0.001	-0.001	-0.001
12-Aug-87	12-Aug-87	112	2.612	2.828	2.597	-0.006	-0.004	-0.004	-0.005
07-Oct-87	07-Oct-87	168	2.626	2.835	2.606	-0.002	-0.002	-0.001	-0.002
20-Jan-88	20-Jan-88	273	2.625	2.837	2.608	-0.002	-0.002	-0.001	-0.002
20-Apr-88	21-Apr-88	364	2.623	2.838	2.607	-0.003	-0.001	-0.001	-0.002
19-Oct-88	20-Oct-88	546	2.638	2.856	2.628	0.002	0.004	0.005	0.003
19-Apr-89	21-Apr-89	728	2.647	2.865	2.635	0.004	0.006	0.007	0.006

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R17 CSA 23.2-14A

Rock Type: Granite

Locality: Bartlett's Mills

Dates Cast:			'Alk %	Temp C
1A,B,C	22-Apr-87	Bin 18	0.94	23
2A,B,C	22-Apr-87	Box R17-2	0.94	38
3A,B,C	22-Apr-87	Bin 18	1.25	23
4A,B,C	22-Apr-87	Box R17-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
23-Apr-87	23-Apr-87	1	2.439	2.612	2.303	0.000	0.000	0.000	0.000
29-Apr-87	29-Apr-87	7	2.444	2.619	2.310	0.001	0.002	0.002	0.002
06-May-87	06-May-87	14	2.432	2.608	2.300	-0.002	-0.001	-0.001	-0.001
20-May-87	20-May-87	28	2.428	2.606	2.299	-0.003	-0.002	-0.001	-0.002
17-Jun-87	17-Jun-87	56	2.437	2.614	2.309	-0.001	0.001	0.002	0.001
15-Jul-87	15-Jul-87	84	2.444	2.619	2.313	0.001	0.002	0.003	0.002
12-Aug-87	12-Aug-87	112	2.433	2.603	2.297	-0.002	-0.003	-0.002	-0.002
07-Oct-87	07-Oct-87	168	2.442	2.618	2.313	0.001	0.002	0.003	0.002
20-Jan-88	20-Jan-88	273	2.442	2.620	2.317	0.001	0.002	0.004	0.002
20-Apr-88	21-Apr-88	364	2.441	2.624	2.317	0.001	0.003	0.004	0.003
19-Oct-88	20-Oct-88	546	2.459	2.637	2.325	0.006	0.007	0.006	0.006
19-Apr-89	21-Apr-89	728	2.470	2.645	2.337	0.009	0.009	0.010	0.009

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
23-Apr-87	23-Apr-87	1	3.195	3.401	2.883	0.000	0.000	0.000	0.000
29-Apr-87	29-Apr-87	7	3.204	3.410	2.886	0.003	0.003	0.001	0.002
06-May-87	06-May-87	14	3.198	3.405	2.879	0.001	0.001	-0.001	.000
20-May-87	20-May-87	28	3.189	3.399	2.874	-0.002	-0.001	-0.003	-0.002
17-Jun-87	17-Jun-87	56	3.197	3.406	2.878	0.001	0.001	-0.001	.000
15-Jul-87	15-Jul-87	84	3.203	3.415	2.887	0.002	0.004	0.001	0.002
12-Aug-87	12-Aug-87	112	3.195	3.403	2.874	0.000	0.001	-0.003	-0.001
07-Oct-87	07-Oct-87	168	3.204	3.419	2.888	0.003	0.005	0.001	0.003
20-Jan-88	20-Jan-88	273	3.203	3.412	2.884	0.002	0.003	.000	0.002
20-Apr-88	21-Apr-88	364	3.205	3.422	2.890	0.003	0.006	0.002	0.004
19-Oct-88	20-Oct-88	546	3.227	3.440	2.914	0.009	0.011	0.009	0.010
19-Apr-89	21-Apr-89	728	3.243	3.456	2.919	0.014	0.016	0.010	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	R18	CSA 23.2-14A
Rock Type:	Granite	
Locality:	Grand Bay	

Dates Cast:

			Alk %	Temp C
1A,B,C	23-Apr-87	Bin 19	0.94	23
2A,B,C	23-Apr-87	Box R18-2	0.94	38
3A,B,C	23-Apr-87	Bin 19	1.25	23
4A,B,C	23-Apr-87	Box R18-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
24-Apr-87	24-Apr-87	1	2.386	2.310	2.966	0.000	0.000	0.000	0.000
30-Apr-87	30-Apr-87	7	2.378	2.300	2.961	-0.002	-0.003	-0.001	-0.002
07-May-87	07-May-87	14	2.372	2.294	2.952	-0.004	-0.005	-0.004	-0.004
21-May-87	21-May-87	28	2.357	2.278	2.939	-0.008	-0.009	-0.008	-0.008
18-Jun-87	18-Jun-87	56	2.365	2.283	2.943	-0.006	-0.008	-0.007	-0.007
16-Jul-87	16-Jul-87	84	2.375	2.295	2.948	-0.003	-0.004	-0.005	-0.004
13-Aug-87	13-Aug-87	112	2.360	2.279	2.939	-0.007	-0.009	-0.008	-0.008
08-Oct-87	08-Oct-87	168	2.370	2.290	2.948	-0.005	-0.006	-0.005	-0.005
21-Jan-88	21-Jan-88	273	2.372	2.290	2.947	-0.004	-0.006	-0.005	-0.005
21-Apr-88	22-Apr-88	364	2.373	2.292	2.953	-0.004	-0.005	-0.004	-0.004
20-Oct-88	21-Oct-88	546	2.386	2.306	2.967	0.000	-0.005	.000	-0.002
20-Apr-89	22-Apr-89	728	2.382	2.300	2.963	-0.001	-0.003	-0.001	-0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
24-Apr-87	24-Apr-87	1	2.498	2.352	2.455	0.000	0.000	0.000	0.000
30-Apr-87	30-Apr-87	7	2.505	2.353	2.459	0.002	.000	0.001	0.001
07-May-87	07-May-87	14	2.487	2.340	2.441	-0.003	-0.003	-0.004	-0.003
21-May-87	21-May-87	28	2.480	2.333	2.435	-0.005	-0.005	-0.006	-0.005
18-Jun-87	18-Jun-87	56	2.482	2.330	2.437	-0.005	-0.006	-0.005	-0.005
16-Jul-87	16-Jul-87	84	2.485	2.337	2.441	-0.004	-0.004	-0.004	-0.004
13-Aug-87	13-Aug-87	112	2.468	2.314	2.417	-0.009	-0.011	-0.011	-0.010
08-Oct-87	08-Oct-87	168	2.485	2.339	2.445	-0.004	-0.004	-0.003	-0.003
21-Jan-88	21-Jan-88	273	2.487	2.345	2.448	-0.003	-0.002	-0.002	-0.002
21-Apr-88	22-Apr-88	364	2.497	2.350	2.454	.000	-0.001	.000	.000
20-Oct-88	21-Oct-88	546	2.507	2.365	2.466	0.003	0.004	0.003	0.003
26-Apr-89	22-Apr-89	734	2.505	2.368	2.466	0.002	0.005	0.003	0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R18 CSA 23.2-14A

Rock Type: Granite

Locality: Grand Bay

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	23-Apr-87	Bin 19	0.94	23	
2A,B,C	23-Apr-87	Box R18-2	0.94	38	
3A,B,C	23-Apr-87	Bin 19	1.25	23	352.806 mm
4A,B,C	23-Apr-87	Box R18-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
24-Apr-87	24-Apr-87	1	2.569	3.215	2.758	0.000	0.000	0.000	0.000
30-Apr-87	30-Apr-87	7	2.570	3.213	2.757	.000	-0.001	.000	.000
07-May-87	07-May-87	14	2.559	3.204	2.745	-0.003	-0.003	-0.004	-0.003
21-May-87	21-May-87	28	2.549	3.192	2.737	-0.006	-0.007	-0.006	-0.006
18-Jun-87	18-Jun-87	56	2.550	3.203	2.741	-0.005	-0.003	-0.005	-0.005
16-Jul-87	16-Jul-87	84	2.542	3.189	2.733	-0.008	-0.007	-0.007	-0.007
13-Aug-87	13-Aug-87	112	2.547	3.197	2.737	-0.006	-0.005	-0.006	-0.006
08-Oct-87	08-Oct-87	168	2.557	3.207	2.747	-0.003	-0.002	-0.003	-0.003
21-Jan-88	21-Jan-88	273	2.557	3.210	2.753	-0.003	-0.001	-0.001	-0.002
21-Apr-88	22-Apr-88	364	2.560	3.211	2.753	-0.003	-0.001	-0.001	-0.002
20-Oct-88	21-Oct-88	546	2.575	3.224	2.766	0.002	0.003	0.002	0.002
20-Apr-89	22-Apr-89	728	2.575	3.223	2.767	0.002	0.002	0.003	0.002

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
24-Apr-87	24-Apr-87	1	3.110	2.554	2.894	0.000	0.000	0.000	0.000
30-Apr-87	30-Apr-87	7	3.124	2.568	2.906	0.004	0.004	0.003	0.004
07-May-87	07-May-87	14	3.106	2.551	2.886	-0.001	-0.001	-0.002	-0.001
21-May-87	21-May-87	28	3.098	2.543	2.875	-0.003	-0.003	-0.005	-0.004
18-Jun-87	18-Jun-87	56	3.103	2.551	2.885	-0.002	-0.001	-0.003	-0.002
16-Jul-87	16-Jul-87	84	3.108	2.554	2.888	-0.001	0.000	-0.002	-0.001
13-Aug-87	13-Aug-87	112	3.092	2.530	2.867	-0.005	-0.007	-0.008	-0.007
08-Oct-87	08-Oct-87	168	3.103	2.553	2.891	-0.002	.000	-0.001	-0.001
21-Jan-88	21-Jan-88	273	3.120	2.562	2.895	0.003	0.002	.000	0.002
21-Apr-88	22-Apr-88	364	3.124	2.573	2.904	0.004	0.005	0.003	0.004
20-Oct-88	21-Oct-88	546	3.137	2.594	2.928	0.008	0.011	0.010	0.010
26-Apr-89	22-Apr-89	734	3.139	2.595	2.924	0.008	0.012	0.009	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R19 CSA 23.2-14A

Rock Type: Quartz Monzonite

Locality: Connolly Quarry

Dates Cast:			Alk %	Temp C
1A,B,C	24-Apr-87	Bin 20	0.94	23
2A,B,C	24-Apr-87	Box R19-2	0.94	38
3A,B,C	24-Apr-87	Bin 20	1.25	23
4A,B,C	24-Apr-87	Box R19-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
25-Apr-87	25-Apr-87	1	3.008	2.766	2.811	0.000	0.000	0.000	0.000
01-May-87	01-May-87	7	3.005	2.761	2.803	-0.001	-0.001	-0.002	-0.002
08-May-87	08-May-87	14	2.998	2.756	2.798	-0.003	-0.003	-0.004	-0.003
22-May-87	22-May-87	28	2.992	2.748	2.790	-0.005	-0.005	-0.006	-0.005
19-Jun-87	19-Jun-87	56	2.989	2.753	2.794	-0.005	-0.004	-0.005	-0.005
17-Jul-87	17-Jul-87	84	2.993	2.754	2.796	-0.004	-0.003	-0.004	-0.004
14-Aug-87	14-Aug-87	112	2.978	2.744	2.788	-0.009	-0.006	-0.007	-0.007
09-Oct-87	09-Oct-87	168	3.004	2.760	2.803	-0.001	-0.002	-0.002	-0.002
22-Jan-88	22-Jan-88	273	3.001	2.759	2.804	-0.002	-0.002	-0.002	-0.002
22-Apr-88	23-Apr-88	364	3.005	2.766	2.805	-0.001	0.000	-0.002	-0.001
21-Oct-88	22-Oct-88	546	3.012	2.774	2.814	0.001	0.002	0.001	0.001
21-Apr-89	23-Apr-89	728	3.008	2.768	2.811	0.000	0.001	0.000	.000

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
25-Apr-87	25-Apr-87	1	2.896	3.424	2.779	0.000	0.000	0.000	0.000
01-May-87	01-May-87	7	2.883	3.407	2.764	-0.004	-0.005	-0.004	-0.004
08-May-87	08-May-87	14	2.880	3.406	2.763	-0.005	-0.005	-0.005	-0.005
22-May-87	22-May-87	28	2.873	3.400	2.754	-0.007	-0.007	-0.007	-0.007
19-Jun-87	19-Jun-87	56	2.877	3.406	2.757	-0.005	-0.005	-0.006	-0.006
17-Jul-87	17-Jul-87	84	2.881	3.412	2.760	-0.004	-0.003	-0.005	-0.004
14-Aug-87	14-Aug-87	112	2.870	3.393	2.750	-0.007	-0.009	-0.008	-0.008
09-Oct-87	09-Oct-87	168	2.890	3.411	2.768	-0.002	-0.004	-0.003	-0.003
22-Jan-88	22-Jan-88	273	2.886	3.415	2.769	-0.003	-0.003	-0.003	-0.003
22-Apr-88	23-Apr-88	364	2.899	3.433	2.779	0.001	0.003	0.000	0.001
21-Oct-88	22-Oct-88	546	2.909	3.435	2.787	0.004	0.003	0.002	0.003
26-Apr-89	23-Apr-89	733	2.901	3.432	2.784	0.001	0.002	0.001	0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R19 CSA 23.2-14A

Rock Type: Quartz Monzonite

Locality: Connolly Quarry

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	24-Apr-87	Bin 20	0.94	23	
2A,B,C	24-Apr-87	Box R19-2	0.94	38	
3A,B,C	24-Apr-87	Bin 20	1.25	23	352.806 mm
4A,B,C	24-Apr-87	Box R19-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
25-Apr-87	25-Apr-87	1	2.685	2.940	2.702	0.000	0.000	0.000	0.000
01-May-87	01-May-87	7	2.688	2.944	2.707	0.001	0.001	0.001	0.001
08-May-87	08-May-87	14	2.684	2.940	2.700	.000	0.000	-0.001	.000
22-May-87	22-May-87	28	2.677	2.930	2.691	-0.002	-0.003	-0.003	-0.003
19-Jun-87	19-Jun-87	56	2.697	2.937	2.698	0.003	-0.001	-0.001	.000
17-Jul-87	17-Jul-87	84	2.687	2.939	2.702	0.001	.000	0.000	.000
14-Aug-87	14-Aug-87	112	2.676	2.930	2.694	-0.003	-0.003	-0.002	-0.003
09-Oct-87	09-Oct-87	168	2.693	2.948	2.710	0.002	0.002	0.002	0.002
22-Jan-88	22-Jan-88	273	2.691	2.947	2.711	0.002	0.002	0.003	0.002
22-Apr-88	23-Apr-88	364	2.695	2.951	2.714	0.003	0.003	0.003	0.003
21-Oct-88	22-Oct-88	546	2.713	2.967	2.731	0.008	0.008	0.008	0.008
21-Apr-89	23-Apr-89	728	2.705	2.958	2.722	0.006	0.005	0.006	0.005

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
25-Apr-87	25-Apr-87	1	2.770	2.620	2.809	0.000	0.000	0.000	0.000
01-May-87	01-May-87	7	2.773	2.619	2.807	0.001	.000	-0.001	.000
08-May-87	08-May-87	14	2.762	2.612	2.801	-0.002	-0.002	-0.002	-0.002
22-May-87	22-May-87	28	2.759	2.609	2.798	-0.003	-0.003	-0.003	-0.003
19-Jun-87	19-Jun-87	56	2.764	2.613	2.800	-0.002	-0.002	-0.003	-0.002
17-Jul-87	17-Jul-87	84	2.767	2.618	2.804	-0.001	-0.001	-0.001	-0.001
14-Aug-87	14-Aug-87	112	2.760	2.606	2.789	-0.003	-0.004	-0.006	-0.004
09-Oct-87	09-Oct-87	168	2.777	2.629	2.815	0.002	0.003	0.002	0.002
22-Jan-88	22-Jan-88	273	2.779	2.627	2.815	0.003	0.002	0.002	0.002
22-Apr-88	23-Apr-88	364	2.787	2.635	2.816	0.005	0.004	0.002	0.004
21-Oct-88	22-Oct-88	546	2.800	2.645	2.833	0.009	0.007	0.007	0.007
26-Apr-89	23-Apr-89	733	2.800	2.651	2.831	0.009	0.009	0.006	0.008

NEWBRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R20 CSA 23.2-14A

Rock Type: Quartz Gabbro

Locality: Bartlett's Mills

Dates Cast:			Alk %	Temp C
1A,B,C	27-Apr-87	Bin 21	0.94	23
2A,B,C	27-Apr-87	Box R20-2	0.94	38
3A,B,C	27-Apr-87	Bin 21	1.25	23
4A,B,C	27-Apr-87	Box R20-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
28-Apr-87	28-Apr-87	1	2.362	2.830	2.946	0.000	0.000	0.000	0.000
04-May-87	04-May-87	7	2.357	2.819	2.929	-0.001	-0.003	-0.005	-0.003
11-May-87	11-May-87	14	2.338	2.808	2.916	-0.007	-0.006	-0.009	-0.007
25-May-87	25-May-87	28	2.359	2.825	2.937	-0.001	-0.001	-0.003	-0.002
22-Jun-87	22-Jun-87	56	2.344	2.812	2.921	-0.005	-0.005	-0.007	-0.006
20-Jul-87	20-Jul-87	84	2.344	2.811	2.920	-0.005	-0.005	-0.007	-0.006
17-Aug-87	17-Aug-87	112	2.347	2.809	2.922	-0.004	-0.006	-0.007	-0.006
12-Oct-87	12-Oct-87	168	2.315	2.781	2.889	-0.013	-0.014	-0.016	-0.014
25-Jan-88	25-Jan-88	273	2.346	2.806	2.917	-0.005	-0.007	-0.008	-0.007
25-Apr-88	26-Apr-88	364	2.352	2.820	2.931	-0.003	-0.003	-0.004	-0.003
24-Oct-88	25-Oct-88	546	2.374	2.833	2.943	0.003	0.001	-0.001	0.001
25-Apr-89	26-Apr-89	729	2.359	2.827	2.938	-0.001	-0.001	-0.002	-0.001

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
28-Apr-87	28-Apr-87	1	3.284	2.893	2.514	0.000	0.000	0.000	0.000
04-May-87	04-May-87	7	3.269	2.879	2.493	-0.004	-0.004	-0.006	-0.005
11-May-87	11-May-87	14	3.263	2.871	2.498	-0.006	-0.006	-0.005	-0.006
25-May-87	25-May-87	28	3.273	2.882	2.508	-0.003	-0.003	-0.002	-0.003
22-Jun-87	22-Jun-87	56	3.246	2.857	2.483	-0.011	-0.010	-0.009	-0.010
20-Jul-87	20-Jul-87	84	3.247	2.852	2.481	-0.010	-0.012	-0.009	-0.010
17-Aug-87	17-Aug-87	112	3.262	2.865	2.492	-0.006	-0.008	-0.006	-0.007
13-Oct-87	12-Oct-87	169	3.268	2.871	2.503	-0.005	-0.006	-0.003	-0.005
26-Jan-88	25-Jan-88	274	3.267	2.876	2.506	-0.005	-0.005	-0.002	-0.004
25-Apr-88	26-Apr-88	364	3.272	2.877	2.510	-0.003	-0.005	-0.001	-0.003
24-Oct-88	25-Oct-88	546	3.290	2.897	2.527	0.002	0.001	0.004	0.002
26-Apr-89	26-Apr-89	730	3.289	2.898	2.529	0.001	0.001	0.004	0.002

NEWBRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R20 CSA 23.2-14A

Rock Type: Quartz Gabbro

Locality: Bartlett's Mills

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	27-Apr-87	Bin 21	0.94	23	
2A,B,C	27-Apr-87	Box R20-2	0.94	38	
3A,B,C	27-Apr-87	Bin 21	1.25	23	352.806 mm
4A,B,C	27-Apr-87	Box R20-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
28-Apr-87	28-Apr-87	1	2.743	2.705	3.081	0.000	0.000	0.000	0.000
04-May-87	04-May-87	7	2.745	2.710	3.085	0.001	0.001	0.001	0.001
11-May-87	11-May-87	14	2.739	2.704	3.078	-0.001	.000	-0.001	-0.001
25-May-87	25-May-87	28	2.756	2.720	3.094	0.004	0.004	0.004	0.004
22-Jun-87	22-Jun-87	56	2.741	2.704	3.079	-0.001	.000	-0.001	.000
20-Jul-87	20-Jul-87	84	2.742	2.706	3.075	.000	.000	-0.002	-0.001
17-Aug-87	17-Aug-87	112	2.730	2.704	3.073	-0.004	.000	-0.002	-0.002
12-Oct-87	12-Oct-87	168	2.705	2.674	3.043	-0.011	-0.009	-0.011	-0.010
25-Jan-88	25-Jan-88	273	2.738	2.704	3.073	-0.001	.000	-0.002	-0.001
25-Apr-88	26-Apr-88	364	2.755	2.720	3.082	0.003	0.004	.000	0.003
24-Oct-88	25-Oct-88	546	2.774	2.735	3.103	0.009	0.009	0.006	0.008
25-Apr-89	26-Apr-89	729	2.766	2.729	3.096	0.007	0.007	0.004	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
28-Apr-87	28-Apr-87	1	3.240	3.290	2.850	0.000	0.000	0.000	0.000
04-May-87	04-May-87	7	3.233	3.294	2.854	-0.002	0.001	0.001	.000
11-May-87	11-May-87	14	3.228	3.286	2.847	-0.003	-0.001	-0.001	-0.002
25-May-87	25-May-87	28	3.246	3.306	2.869	0.002	0.005	0.005	0.004
22-Jun-87	22-Jun-87	56	3.226	3.286	2.850	-0.004	-0.001	0.000	-0.002
20-Jul-87	20-Jul-87	84	3.227	3.288	2.846	-0.004	-0.001	-0.001	-0.002
17-Aug-87	17-Aug-87	112	3.236	3.295	2.855	-0.001	0.001	0.001	0.001
13-Oct-87	12-Oct-87	169	3.239	3.301	2.860	.000	0.003	0.003	0.002
26-Jan-88	25-Jan-88	274	3.245	3.306	2.864	0.001	0.005	0.004	0.003
25-Apr-88	26-Apr-88	364	3.250	3.312	2.864	0.003	0.006	0.004	0.004
24-Oct-88	25-Oct-88	546	3.266	3.328	2.883	0.007	0.011	0.009	0.009
26-Apr-89	26-Apr-89	730	3.270	3.325	2.878	0.009	0.010	0.008	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R21 CSA 23.2-14A

Rock Type: Chloritized Basalt

Locality: Beresford

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	28-Apr-87	Bin 22	0.94	23	
2A,B,C	28-Apr-87	Box R21-2	0.94	38	
3A,B,C	28-Apr-87	Bin 22	1.25	23	352.806 mm
4A,B,C	28-Apr-87	Box R21-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
29-Apr-87	29-Apr-87	1	3.225	2.730	2.408	0.000	0.000	0.000	0.000
05-May-87	05-May-87	7	3.216	2.723	2.402	-0.003	-0.002	-0.002	-0.002
12-May-87	12-May-87	14	3.210	2.716	2.396	-0.004	-0.004	-0.003	-0.004
26-May-87	26-May-87	28	3.212	2.716	2.396	-0.004	-0.004	-0.003	-0.004
23-Jun-87	23-Jun-87	56	3.207	2.711	2.392	-0.005	-0.005	-0.005	-0.005
21-Jul-87	21-Jul-87	84	3.213	2.718	2.394	-0.003	-0.003	-0.004	-0.004
18-Aug-87	18-Aug-87	112	3.204	2.711	2.386	-0.006	-0.005	-0.006	-0.006
13-Oct-87	13-Oct-87	168	3.220	2.729	2.409	-0.001	.000	.000	.000
26-Jan-88	26-Jan-88	273	3.215	2.723	2.395	-0.003	-0.002	-0.004	-0.003
26-Apr-88	27-Apr-88	364	3.218	2.725	2.403	-0.002	-0.001	-0.001	-0.002
25-Oct-88	26-Oct-88	546	3.228	2.735	2.415	0.001	0.001	0.002	0.001
25-Apr-89	27-Apr-89	728	3.228	2.738	2.415	0.001	0.002	0.002	0.002

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
29-Apr-87	29-Apr-87	1	2.608	2.528	2.399	0.000	0.000	0.000	0.000
05-May-87	05-May-87	7	2.591	2.513	2.388	-0.005	-0.004	-0.003	-0.004
12-May-87	12-May-87	14	2.592	2.516	2.389	-0.005	-0.003	-0.003	-0.004
26-May-87	26-May-87	28	2.594	2.517	2.389	-0.004	-0.003	-0.003	-0.003
23-Jun-87	23-Jun-87	56	2.582	2.508	2.383	-0.007	-0.006	-0.005	-0.006
21-Jul-87	21-Jul-87	84	2.593	2.521	2.393	-0.004	-0.002	-0.002	-0.003
18-Aug-87	18-Aug-87	112	2.591	2.514	2.390	-0.005	-0.004	-0.003	-0.004
12-Oct-87	13-Oct-87	167	2.597	2.515	2.387	-0.003	-0.004	-0.003	-0.003
26-Jan-88	26-Jan-88	273	2.605	2.526	2.398	-0.001	-0.001	.000	-0.001
27-Apr-88	27-Apr-88	365	2.603	2.537	2.400	-0.001	0.003	.000	.000
25-Oct-88	26-Oct-88	546	2.613	2.541	2.418	0.001	0.004	0.005	0.003
27-Apr-89	27-Apr-89	730	2.609	2.537	2.405	.000	0.003	0.002	0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R21 CSA 23.2-14A

Rock Type: Chloritized Basalt

Locality: Beresford

	Dates Cast:		Alk %	Temp C	Sample Lengths:
1A,B,C	28-Apr-87	Bin 22	0.94	23	
2A,B,C	28-Apr-87	Box R21-2	0.94	38	
3A,B,C	28-Apr-87	Bin 22	1.25	23	352.806 mm
4A,B,C	28-Apr-87	Box R21-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
29-Apr-87	29-Apr-87	1	2.866	3.201	2.731	0.000	0.000	0.000	0.000
05-May-87	05-May-87	7	2.844	3.181	2.718	-0.006	-0.006	-0.004	-0.005
12-May-87	12-May-87	14	2.866	3.198	2.730	0.000	-0.001	.000	.000
26-May-87	26-May-87	28	2.862	3.194	2.727	-0.001	-0.002	-0.001	-0.001
23-Jun-87	23-Jun-87	56	2.861	3.192	2.723	-0.001	-0.003	-0.002	-0.002
21-Jul-87	21-Jul-87	84	2.862	3.193	2.724	-0.001	-0.002	-0.002	-0.002
18-Aug-87	18-Aug-87	112	2.852	3.189	2.721	-0.004	-0.003	-0.003	-0.003
13-Oct-87	13-Oct-87	168	2.876	3.206	2.741	0.003	0.001	0.003	0.002
26-Jan-88	26-Jan-88	273	2.865	3.201	2.733	.000	0.000	0.001	.000
26-Apr-88	27-Apr-88	364	2.876	3.203	2.740	0.003	0.001	0.003	0.002
25-Oct-88	26-Oct-88	546	2.887	3.220	2.753	0.006	0.005	0.006	0.006
25-Apr-89	27-Apr-89	728	2.889	3.220	2.756	0.007	0.005	0.007	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
29-Apr-87	29-Apr-87	1	2.464	2.441	2.861	0.000	0.000	0.000	0.000
05-May-87	05-May-87	7	2.458	2.435	2.852	-0.002	-0.002	-0.003	-0.002
12-May-87	12-May-87	14	2.459	2.435	2.854	-0.001	-0.002	-0.002	-0.002
26-May-87	26-May-87	28	2.454	2.435	2.853	-0.003	-0.002	-0.002	-0.002
23-Jun-87	23-Jun-87	56	2.455	2.436	2.850	-0.003	-0.001	-0.003	-0.002
21-Jul-87	21-Jul-87	84	2.462	2.441	2.857	-0.001	0.000	-0.001	-0.001
18-Aug-87	18-Aug-87	112	2.455	2.436	2.853	-0.003	-0.001	-0.002	-0.002
12-Oct-87	13-Oct-87	167	2.441	2.417	2.835	-0.007	-0.007	-0.007	-0.007
26-Jan-88	26-Jan-88	273	2.475	2.455	2.870	0.003	0.004	0.003	0.003
26-Apr-88	27-Apr-88	364	2.475	2.460	2.878	0.003	0.005	0.005	0.004
25-Oct-88	26-Oct-88	546	2.497	2.490	2.903	0.009	0.014	0.012	0.012
27-Apr-89	27-Apr-89	730	2.480	2.484	2.893	0.005	0.012	0.009	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R22 CSA 23.2-14A

Rock Type: Limestone

Locality: Havelock

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	29-Apr-87	Bin 23	0.94	23	
2A,B,C	29-Apr-87	Box R22-2	0.94	38	
3A,B,C	29-Apr-87	Bin 23	1.25	23	352.806 mm
4A,B,C	29-Apr-87	Box R22-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
30-Apr-87	30-Apr-87	1	2.760	2.991	2.650	0.000	0.000	0.000	0.000
06-May-87	06-May-87	7	2.737	2.974	2.630	-0.007	-0.005	-0.006	-0.006
13-May-87	13-May-87	14	2.744	2.976	2.639	-0.005	-0.004	-0.003	-0.004
27-May-87	27-May-87	28	2.732	2.965	2.624	-0.008	-0.007	-0.007	-0.008
24-Jun-87	24-Jun-87	56	2.739	2.974	2.628	-0.006	-0.005	-0.006	-0.006
22-Jul-87	22-Jul-87	84	2.739	2.972	2.626	-0.006	-0.005	-0.007	-0.006
19-Aug-87	19-Aug-87	112	2.732	2.968	2.623	-0.008	-0.007	-0.008	-0.007
14-Oct-87	14-Oct-87	168	2.745	2.985	2.644	-0.004	-0.002	-0.002	-0.003
27-Jan-88	27-Jan-88	273	2.754	2.986	2.640	-0.002	-0.001	-0.003	-0.002
27-Apr-88	28-Apr-88	364	2.750	2.980	2.638	-0.003	-0.003	-0.003	-0.003
26-Oct-88	27-Oct-88	546	2.767	2.997	2.651	0.002	0.002	.000	0.001
26-Apr-89	28-Apr-89	728	2.756	2.990	2.649	-0.001	.000	.000	-0.001

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
30-Apr-87	30-Apr-87	1	2.615	2.796	2.923	0.000	0.000	0.000	0.000
06-May-87	06-May-87	7	2.591	2.774	2.906	-0.007	-0.006	-0.005	-0.006
13-May-87	13-May-87	14	2.600	2.780	2.907	-0.004	-0.005	-0.005	-0.004
27-May-87	27-May-87	28	2.589	2.770	2.898	-0.007	-0.007	-0.007	-0.007
24-Jun-87	24-Jun-87	56	2.598	2.777	2.907	-0.005	-0.005	-0.005	-0.005
22-Jul-87	22-Jul-87	84	2.592	2.770	2.900	-0.007	-0.007	-0.007	-0.007
19-Aug-87	19-Aug-87	112	2.598	2.777	2.902	-0.005	-0.005	-0.006	-0.005
14-Oct-87	14-Oct-87	168	2.608	2.788	2.916	-0.002	-0.002	-0.002	-0.002
27-Jan-88	27-Jan-88	273	2.612	2.791	2.922	-0.001	-0.001	.000	-0.001
26-Apr-88	28-Apr-88	363	2.606	2.793	2.917	-0.003	-0.001	-0.002	-0.002
26-Oct-88	27-Oct-88	546	2.622	2.810	2.937	0.002	0.004	0.004	0.003
27-Apr-89	28-Apr-89	729	2.604	2.791	2.918	-0.003	-0.001	-0.001	-0.002

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	R22	CSA 23.2-14A		
Rock Type:	Limestone			
Locality:	Havelock			

	Dates Cast:		Alk %	Temp C	Sample Lengths:
1A,B,C	29-Apr-87	Bin 23	0.94	23	
2A,B,C	29-Apr-87	Box R22-2	0.94	38	
3A,B,C	29-Apr-87	Bin 23	1.25	23	352.806 mm
4A,B,C	29-Apr-87	Box R22-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
30-Apr-87	30-Apr-87	1	2.718	2.744	3.111	0.000	0.000	0.000	0.000
06-May-87	06-May-87	7	2.709	2.733	3.107	-0.003	-0.003	-0.001	-0.002
13-May-87	13-May-87	14	2.718	2.739	3.115	0.000	-0.001	0.001	.000
27-May-87	27-May-87	28	2.705	2.726	3.100	-0.004	-0.005	-0.003	-0.004
24-Jun-87	24-Jun-87	56	2.714	2.737	3.112	-0.001	-0.002	.000	-0.001
22-Jul-87	22-Jul-87	84	2.716	2.738	3.111	-0.001	-0.002	0.000	-0.001
19-Aug-87	19-Aug-87	112	2.712	2.735	3.116	-0.002	-0.003	0.001	-0.001
14-Oct-87	14-Oct-87	168	2.729	2.756	3.125	0.003	0.003	0.004	0.003
27-Jan-88	27-Jan-88	273	2.729	2.753	3.130	0.003	0.003	0.005	0.004
27-Apr-88	28-Apr-88	364	2.729	2.754	3.124	0.003	0.003	0.004	0.003
26-Oct-88	27-Oct-88	546	2.746	2.770	3.144	0.008	0.007	0.009	0.008
26-Apr-89	28-Apr-89	728	2.744	2.765	3.144	0.007	0.006	0.009	0.008

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
30-Apr-87	30-Apr-87	1	2.803	2.639	2.462	0.000	0.000	0.000	0.000
06-May-87	06-May-87	7	2.792	2.626	2.458	-0.003	-0.004	-0.001	-0.003
13-May-87	13-May-87	14	2.792	2.635	2.458	-0.003	-0.001	-0.001	-0.002
27-May-87	27-May-87	28	2.788	2.632	2.452	-0.004	-0.002	-0.003	-0.003
24-Jun-87	24-Jun-87	56	2.800	2.641	2.462	-0.001	0.001	0.000	.000
22-Jul-87	22-Jul-87	84	2.799	2.642	2.460	-0.001	0.001	-0.001	.000
19-Aug-87	19-Aug-87	112	2.806	2.649	2.466	0.001	0.003	0.001	0.002
14-Oct-87	14-Oct-87	168	2.813	2.656	2.471	0.003	0.005	0.003	0.003
27-Jan-88	27-Jan-88	273	2.818	2.666	2.482	0.004	0.008	0.006	0.006
27-Apr-88	28-Apr-88	364	2.816	2.661	2.477	0.004	0.006	0.004	0.005
26-Oct-88	27-Oct-88	546	2.836	2.687	2.500	0.009	0.014	0.011	0.011
27-Apr-89	28-Apr-89	729	2.817	2.667	2.478	0.004	0.008	0.005	0.005

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R23 CSA 23.2-14A

Rock Type: Dolomite

Locality: Brookville

Dates Cast:			Alk %	Temp c
1A,B,C	30-Apr-87	Bin 24	0.94	23
2A,B,C	30-Apr-87	Box R23-2	0.94	38
3A,B,C	30-Apr-87	Bin 24	1.25	23
4A,B,C	30-Apr-87	Box R23-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
01-May-87	01-May-87	1	2.646	3.154	3.206	0.000	0.000	0.000	0.000
07-May-87	07-May-87	7	2.645	3.154	3.207	.000	0.000	.000	0.000
14-May-87	14-May-87	14	2.636	3.143	3.197	-0.003	-0.003	-0.003	-0.003
28-May-87	28-May-87	28	2.628	3.137	3.191	-0.005	-0.005	-0.004	-0.005
25-Jun-87	25-Jun-87	56	2.642	3.149	3.203	-0.001	-0.001	-0.001	-0.001
23-Jul-87	23-Jul-87	84	2.637	3.146	3.199	-0.003	-0.002	-0.002	-0.002
20-Aug-87	20-Aug-87	112	2.636	3.141	3.195	-0.003	-0.004	-0.003	-0.003
15-Oct-87	15-Oct-87	168	2.650	3.159	3.214	0.001	0.001	0.002	0.002
28-Jan-88	28-Jan-88	273	2.659	3.167	3.221	0.004	0.004	0.004	0.004
28-Apr-88	29-Apr-88	364	2.646	3.151	3.204	0.000	-0.001	-0.001	.000
28-Oct-88	28-Oct-88	547	2.665	3.172	3.226	0.005	0.005	0.006	0.005
27-Apr-89	29-Apr-89	728	2.668	3.172	3.229	0.006	0.005	0.007	0.006

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
01-May-87	01-May-87	1	2.929	2.755	3.030	0.000	0.000	0.000	0.000
07-May-87	07-May-87	7	2.935	2.757	3.037	0.002	0.001	0.002	0.001
14-May-87	14-May-87	14	2.927	2.748	3.028	-0.001	-0.002	-0.001	-0.001
28-May-87	28-May-87	28	2.926	2.745	3.025	-0.001	-0.003	-0.001	-0.002
25-Jun-87	25-Jun-87	56	2.931	2.753	3.032	0.001	-0.001	0.001	.000
23-Jul-87	23-Jul-87	84	2.924	2.745	3.023	-0.001	-0.003	-0.002	-0.002
20-Aug-87	20-Aug-87	112	2.928	2.750	3.028	.000	-0.001	-0.001	-0.001
15-Oct-87	15-Oct-87	168	2.944	2.766	3.043	0.004	0.003	0.004	0.004
28-Jan-88	28-Jan-88	273	2.945	2.769	3.050	0.005	0.004	0.006	0.005
28-Apr-88	29-Apr-88	364	2.943	2.765	3.041	0.004	0.003	0.003	0.003
28-Oct-88	28-Oct-88	547	2.957	2.784	3.061	0.008	0.008	0.009	0.008
27-Apr-89	29-Apr-89	728	2.948	2.771	3.051	0.005	0.005	0.006	0.005

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R23 CSA 23.2-14A

Rock Type: Dolomite

Locality: Brookville

Dates Cast:

			Alk %	Temp c
1A,B,C	30-Apr-87	Bin 24	0.94	23
2A,B,C	30-Apr-87	Box R23-2	0.94	38
3A,B,C	30-Apr-87	Bin 24	1.25	23
4A,B,C	30-Apr-87	Box R23-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
01-May-87	01-May-87	1	2.479	2.741	2.403	0.000	0.000	0.000	0.000
07-May-87	07-May-87	7	2.498	2.761	2.415	0.005	0.006	0.003	0.005
14-May-87	14-May-87	14	2.487	2.751	2.406	0.002	0.003	0.001	0.002
28-May-87	28-May-87	28	2.481	2.749	2.402	0.001	0.002	.000	0.001
25-Jun-87	25-Jun-87	56	2.496	2.757	2.414	0.005	0.005	0.003	0.004
23-Jul-87	23-Jul-87	84	2.490	2.752	2.406	0.003	0.003	0.001	0.002
20-Aug-87	20-Aug-87	112	2.485	2.749	2.403	0.002	0.002	0.000	0.001
15-Oct-87	15-Oct-87	168	2.506	2.768	2.420	0.008	0.008	0.005	0.007
28-Jan-88	28-Jan-88	273	2.513	2.778	2.429	0.010	0.010	0.007	0.009
28-Apr-88	29-Apr-88	364	2.500	2.766	2.418	0.006	0.007	0.004	0.006
28-Oct-88	28-Oct-88	547	2.522	2.783	2.436	0.012	0.012	0.009	0.011
27-Apr-89	29-Apr-89	728	2.525	2.786	2.439	0.013	0.013	0.010	0.012

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
01-May-87	01-May-87	1	2.864	2.781	3.143	0.000	0.000	0.000	0.000
07-May-87	07-May-87	7	2.876	2.796	3.169	0.003	0.004	0.007	0.005
14-May-87	14-May-87	14	2.874	2.788	3.160	0.003	0.002	0.005	0.003
28-May-87	28-May-87	28	2.871	2.785	3.158	0.002	0.001	0.004	0.002
25-Jun-87	25-Jun-87	56	2.884	2.795	3.165	0.006	0.004	0.006	0.005
23-Jul-87	23-Jul-87	84	2.874	2.785	3.157	0.003	0.001	0.004	0.003
20-Aug-87	20-Aug-87	112	2.879	2.787	3.161	0.004	0.002	0.005	0.004
15-Oct-87	15-Oct-87	168	2.895	2.805	3.175	0.009	0.007	0.009	0.008
28-Jan-88	28-Jan-88	273	2.900	2.814	3.182	0.010	0.009	0.011	0.010
28-Apr-88	29-Apr-88	364	2.898	2.805	3.173	0.010	0.007	0.009	0.008
28-Oct-88	28-Oct-88	547	2.916	2.828	3.195	0.015	0.013	0.015	0.014
27-Apr-89	29-Apr-89	728	2.902	2.816	3.183	0.011	0.010	0.011	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R24 CSA 23.2-14A

Rock Type: Limestone

Locality: Muniac

Dates Cast:

			Alk %	Temp C
1A,B,C	01-May-87	Bin 25	0.94	23
2A,B,C	01-May-87	Box R24-2	0.94	38
3A,B,C	01-May-87	Bin 25	1.25	23
4A,B,C	01-May-87	Box R24-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
02-May-87	02-May-87	1	2.849	3.200	2.885	0.000	0.000	0.000	0.000
08-May-87	08-May-87	7	2.863	3.212	2.898	0.004	0.003	0.004	0.004
15-May-87	15-May-87	14	2.850	3.196	2.881	.000	-0.001	-0.001	-0.001
29-May-87	29-May-87	28	2.864	3.209	2.896	0.004	0.003	0.003	0.003
26-Jun-87	26-Jun-87	56	2.872	3.219	2.906	0.007	0.005	0.006	0.006
24-Jul-87	24-Jul-87	84	2.868	3.213	2.898	0.005	0.004	0.004	0.004
21-Aug-87	21-Aug-87	112	2.865	3.211	2.898	0.005	0.003	0.004	0.004
16-Oct-87	16-Oct-87	168	2.882	3.230	2.913	0.009	0.009	0.008	0.009
29-Jan-88	29-Jan-88	273	2.870	3.214	2.909	0.006	0.004	0.007	0.006
29-Apr-88	30-Apr-88	364	2.885	3.232	2.920	0.010	0.009	0.010	0.010
28-Oct-88	29-Oct-88	546	2.903	3.247	2.940	0.015	0.013	0.016	0.015
28-Apr-89	30-Apr-89	728	2.898	3.244	2.938	0.014	0.012	0.015	0.014

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
02-May-87	02-May-87	1	2.702	2.707	3.059	0.000	0.000	0.000	0.000
08-May-87	08-May-87	7	2.690	2.718	3.071	-0.003	0.003	0.003	0.001
15-May-87	15-May-87	14	2.677	2.710	3.068	-0.007	0.001	0.003	-0.001
29-May-87	29-May-87	28	2.700	2.731	3.083	-0.001	0.007	0.007	0.004
26-Jun-87	26-Jun-87	56	2.724	2.751	3.099	0.006	0.012	0.011	0.010
24-Jul-87	24-Jul-87	84	2.723	2.752	3.097	0.006	0.013	0.011	0.010
21-Aug-87	21-Aug-87	112	2.725	2.756	3.105	0.007	0.014	0.013	0.011
16-Oct-87	16-Oct-87	168	2.771	2.813	3.164	0.020	0.030	0.030	0.026
29-Jan-88	29-Jan-88	273	2.779	2.847	3.189	0.022	0.040	0.037	0.033
29-Apr-88	30-Apr-88	364	2.797	2.868	3.208	0.027	0.046	0.042	0.038
28-Oct-88	29-Oct-88	546	2.825	2.901	3.238	0.035	0.055	0.051	0.047
28-Apr-89	30-Apr-89	728	2.834	2.912	3.243	0.037	0.058	0.052	0.049

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R24 CSA 23.2-14A

Rock Type: Limestone

Locality: Muniac

Dates Cast:

			Alk %	Temp C
1A,B,C	01-May-87	Bin 25	0.94	23
2A,B,C	01-May-87	Box R24-2	0.94	38
3A,B,C	01-May-87	Bin 25	1.25	23
4A,B,C	01-May-87	Box R24-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
02-May-87	02-May-87	1	2.975	2.674	2.897	0.000	0.000	0.000	0.000
08-May-87	08-May-87	7	2.996	2.697	2.916	0.006	0.007	0.005	0.006
15-May-87	15-May-87	14	2.985	2.687	2.909	0.003	0.004	0.003	0.003
29-May-87	29-May-87	28	2.998	2.699	2.921	0.007	0.007	0.007	0.007
26-Jun-87	26-Jun-87	56	3.008	2.712	2.931	0.009	0.011	0.010	0.010
24-Jul-87	24-Jul-87	84	3.001	2.706	2.925	0.007	0.009	0.008	0.008
21-Aug-87	21-Aug-87	112	3.005	2.704	2.926	0.009	0.009	0.008	0.008
16-Oct-87	16-Oct-87	168	3.029	2.729	2.945	0.015	0.016	0.014	0.015
29-Jan-88	29-Jan-88	273	3.022	2.724	2.939	0.013	0.014	0.012	0.013
29-Apr-88	30-Apr-88	364	3.040	2.744	2.959	0.018	0.020	0.018	0.019
28-Oct-88	29-Oct-88	546	3.064	2.762	2.981	0.025	0.025	0.024	0.025
28-Apr-89	30-Apr-89	728	3.062	2.758	2.983	0.025	0.024	0.024	0.024

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
02-May-87	02-May-87	1	2.904	2.865	2.724	0.000	0.000	0.000	0.000
08-May-87	08-May-87	7	2.925	2.885	2.739	0.006	0.006	0.004	0.005
15-May-87	15-May-87	14	2.906	2.863	2.726	0.001	-0.001	0.001	.000
29-May-87	29-May-87	28	2.939	2.901	2.763	0.010	0.010	0.011	0.010
26-Jun-87	26-Jun-87	56	2.991	2.962	2.822	0.025	0.027	0.028	0.027
24-Jul-87	24-Jul-87	84	3.066	3.080	2.930	0.046	0.061	0.058	0.055
21-Aug-87	21-Aug-87	112	3.163	3.288	3.068	0.073	0.120	0.098	0.097
16-Oct-87	16-Oct-87	168	3.377	3.592	3.362	0.134	0.206	0.181	0.174
29-Jan-88	29-Jan-88	273	3.518	3.932	3.594	0.174	0.302	0.247	0.241
29-Apr-88	30-Apr-88	364	3.557	4.023	3.650	0.185	0.328	0.262	0.259
28-Oct-88	29-Oct-88	546	3.584	4.068	3.684	0.193	0.341	0.272	0.269
28-Apr-89	30-Apr-89	728	3.591	4.077	3.689	0.195	0.344	0.274	0.271

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R25 CSA 23.2-14A

Rock Type: Limestone

Locality: Sormany

Dates Cast:

			Alk %	Temp C
1A,B,C	04-May-87	Bin 26	0.94	23
2A,B,C	04-May-87	Box R25-2	0.94	38
3A,B,C	04-May-87	Bin 26	1.25	23
4A,B,C	04-May-87	Box R25-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
05-May-87	05-May-87	1	2.865	2.740	2.836	0.000	0.000	0.000	0.000
11-May-87	11-May-87	7	2.858	2.735	2.832	-0.002	-0.001	-0.001	-0.002
18-May-87	18-May-87	14	2.857	2.731	2.829	-0.002	-0.003	-0.002	-0.002
01-Jun-87	01-Jun-87	28	2.848	2.723	2.820	-0.005	-0.005	-0.005	-0.005
29-Jun-87	29-Jun-87	56	2.854	2.731	2.825	-0.003	-0.003	-0.003	-0.003
27-Jul-87	27-Jul-87	84	2.861	2.737	2.835	-0.001	-0.001	.000	-0.001
24-Aug-87	24-Aug-87	112	2.843	2.719	2.817	-0.006	-0.006	-0.005	-0.006
19-Oct-87	19-Oct-87	168	2.868	2.746	2.846	0.001	0.002	0.003	0.002
01-Feb-88	01-Feb-88	273	2.871	2.749	2.845	0.002	0.003	0.003	0.002
02-May-88	03-May-88	364	2.872	2.752	2.850	0.002	0.003	0.004	0.003
31-Oct-88	01-Nov-88	546	2.885	2.765	2.861	0.006	0.007	0.007	0.007
01-May-89	03-May-89	728	2.895	2.774	2.875	0.009	0.010	0.011	0.010

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
05-May-87	05-May-87	1	3.024	2.701	2.872	0.000	0.000	0.000	0.000
11-May-87	11-May-87	7	3.020	2.701	2.869	-0.001	0.000	-0.001	-0.001
18-May-87	18-May-87	14	3.011	2.698	2.865	-0.004	-0.001	-0.002	-0.002
01-Jun-87	01-Jun-87	28	3.010	2.689	2.858	-0.004	-0.003	-0.004	-0.004
29-Jun-87	29-Jun-87	56	3.023	2.701	2.866	.000	0.000	-0.002	-0.001
27-Jul-87	27-Jul-87	84	3.021	2.704	2.871	-0.001	0.001	.000	.000
24-Aug-87	24-Aug-87	112	3.008	2.689	2.858	-0.005	-0.003	-0.004	-0.004
19-Oct-87	19-Oct-87	168	3.039	2.713	2.883	0.004	0.003	0.003	0.004
01-Feb-88	01-Feb-88	273	3.043	2.724	2.894	0.005	0.007	0.006	0.006
02-May-88	03-May-88	364	3.044	2.727	2.894	0.006	0.007	0.006	0.006
31-Oct-88	01-Nov-88	546	3.065	2.745	2.915	0.012	0.012	0.012	0.012
01-May-89	03-May-89	728	3.067	2.752	2.920	0.012	0.014	0.014	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: R25 CSA 23.2-14A

Rock Type: Limestone

Locality: Sormany

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	04-May-87	Bin 26	0.94	23	
2A,B,C	04-May-87	Box R25-2	0.94	38	
3A,B,C	04-May-87	Bin 26	1.25	23	352.806 mm
4A,B,C	04-May-87	Box R25-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
05-May-87	05-May-87	1	3.080	3.148	2.579	0.000	0.000	0.000	0.000
11-May-87	11-May-87	7	3.088	3.152	2.581	0.002	0.001	0.001	0.001
18-May-87	18-May-87	14	3.081	3.151	2.581	.000	0.001	0.001	0.001
01-Jun-87	01-Jun-87	28	3.077	3.147	2.576	-0.001	.000	-0.001	-0.001
29-Jun-87	29-Jun-87	56	3.086	3.156	2.586	0.002	0.002	0.002	0.002
27-Jul-87	27-Jul-87	84	3.093	3.162	2.598	0.004	0.004	0.005	0.004
24-Aug-87	24-Aug-87	112	3.075	3.147	2.580	-0.001	.000	.000	.000
19-Oct-87	19-Oct-87	168	3.102	3.171	2.604	0.006	0.007	0.007	0.007
01-Feb-88	01-Feb-88	273	3.107	3.180	2.614	0.008	0.009	0.010	0.009
02-May-88	03-May-88	364	3.108	3.178	2.607	0.008	0.009	0.008	0.008
31-Oct-88	01-Nov-88	546	3.113	3.184	2.604	0.009	0.010	0.007	0.009
01-May-89	03-May-89	728	3.120	3.195	2.621	0.011	0.013	0.012	0.012

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
05-May-87	05-May-87	1	3.156	2.667	3.054	0.000	0.000	0.000	0.000
11-May-87	11-May-87	7	3.164	2.676	3.063	0.002	0.003	0.003	0.002
18-May-87	18-May-87	14	3.157	2.669	3.056	.000	0.001	0.001	.000
01-Jun-87	01-Jun-87	28	3.160	2.676	3.059	0.001	0.003	0.001	0.002
29-Jun-87	29-Jun-87	56	3.163	2.675	3.063	0.002	0.002	0.003	0.002
27-Jul-87	27-Jul-87	84	3.165	2.681	3.063	0.003	0.004	0.003	0.003
24-Aug-87	24-Aug-87	112	3.160	2.669	3.058	0.001	0.001	0.001	0.001
19-Oct-87	19-Oct-87	168	3.186	2.696	3.087	0.009	0.008	0.009	0.009
01-Feb-88	01-Feb-88	273	3.195	2.716	3.103	0.011	0.014	0.014	0.013
02-May-88	03-May-88	364	3.195	2.718	3.101	0.011	0.014	0.013	0.013
31-Oct-88	01-Nov-88	546	3.222	2.743	3.123	0.019	0.022	0.020	0.020
01-May-89	03-May-89	728	3.232	2.752	3.132	0.022	0.024	0.022	0.023

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CR1 CSA 23.2-14A

Rock Type: Control-Spratt Limestone

Locality: Spratt

Dates Cast:			Alk %	Temp c	Sample Lengths:
1A,B,C	05-May-87	Bin 27	0.94	23	
2A,B,C	05-May-87	Box CR1-2	0.94	38	
3A,B,C	07-May-87	Bin 27	1.25	23	352.806 mm
4A,B,C	07-May-87	Box CR1-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
06-May-87	06-May-87	1	2.431	3.086	3.420	0.000	0.000	0.000	0.000
12-May-87	12-May-87	7	2.431	3.088	3.424	0.000	0.001	0.001	0.001
19-May-87	19-May-87	14	2.432	3.087	3.424	.000	.000	0.001	0.001
02-Jun-87	02-Jun-87	28	2.431	3.085	3.425	0.000	.000	0.001	.000
30-Jun-87	30-Jun-87	56	2.433	3.089	3.427	0.001	0.001	0.002	0.001
28-Jul-87	28-Jul-87	84	2.434	3.091	3.427	0.001	0.001	0.002	0.001
25-Aug-87	25-Aug-87	112	2.428	3.089	3.423	-0.001	0.001	0.001	.000
20-Oct-87	20-Oct-87	168	2.454	3.112	3.447	0.007	0.007	0.008	0.007
02-Feb-88	02-Feb-88	273	2.454	3.111	3.444	0.007	0.007	0.007	0.007
04-May-88	04-May-88	365	2.460	3.112	3.445	0.008	0.007	0.007	0.008
07-Jul-88	07-Jul-88	429	2.451	3.107	3.442	0.006	0.006	0.006	0.006
01-Nov-88	02-Nov-88	546	2.482	3.140	3.473	0.014	0.015	0.015	0.015
02-May-89	04-May-89	728	2.469	3.125	3.460	0.011	0.011	0.011	0.011

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
06-May-87	06-May-87	1	3.180	2.774	2.595	0.000	0.000	0.000	0.000
12-May-87	12-May-87	7	3.181	2.771	2.593	.000	-0.001	-0.001	.000
19-May-87	19-May-87	14	3.187	2.771	2.597	0.002	-0.001	0.001	0.001
02-Jun-87	02-Jun-87	28	3.191	2.777	2.602	0.003	0.001	0.002	0.002
30-Jun-87	30-Jun-87	56	3.207	2.794	2.618	0.008	0.006	0.007	0.007
28-Jul-87	28-Jul-87	84	3.233	2.857	2.655	0.015	0.024	0.017	0.019
25-Aug-87	25-Aug-87	112	3.282	3.003	2.742	0.029	0.065	0.042	0.045
20-Oct-87	20-Oct-87	168	3.420	3.304	2.939	0.068	0.150	0.098	0.105
02-Feb-88	02-Feb-88	273	3.467	3.465	3.029	0.081	0.196	0.123	0.133
04-May-88	04-May-88	365	3.479	3.485	3.044	0.085	0.202	0.127	0.138
07-Jul-88	07-Jul-88	429	3.474	3.483	3.035	0.083	0.201	0.125	0.136
01-Nov-88	02-Nov-88	546	3.508	3.522	3.073	0.093	0.212	0.135	0.147
02-May-89	04-May-89	728	3.492	3.506	3.055	0.088	0.207	0.130	0.142

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CR1 CSA 23.2-14A

Rock Type: Control-Spratt Limestone

Locality: Spratt

Dates Cast:

			Alk %	Temp c
1A,B,C	05-May-87	Bin 27	0.94	23
2A,B,C	05-May-87	Box CR1-2	0.94	38
3A,B,C	07-May-87	Bin 27	1.25	23
4A,B,C	07-May-87	Box CR1-4	1.25	38

Sample
Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
08-May-87	08-May-87	1	3.030	2.589	3.109	0.000	0.000	0.000	0.000
14-May-87	14-May-87	7	3.044	2.606	3.123	0.004	0.005	0.004	0.004
21-May-87	21-May-87	14	3.041	2.608	3.122	0.003	0.005	0.004	0.004
04-Jun-87	04-Jun-87	28	3.049	2.611	3.129	0.005	0.006	0.006	0.006
02-Jul-87	02-Jul-87	56	3.057	2.620	3.137	0.008	0.009	0.008	0.008
30-Jul-87	30-Jul-87	84	3.042	2.603	3.122	0.003	0.004	0.004	0.004
27-Aug-87	27-Aug-87	112	3.055	2.616	3.133	0.007	0.008	0.007	0.007
22-Oct-87	22-Oct-87	168	3.068	2.635	3.155	0.011	0.013	0.013	0.012
04-Feb-88	04-Feb-88	273	3.097	2.673	3.180	0.019	0.024	0.020	0.021
06-May-88	06-May-88	365	3.120	2.708	3.229	0.026	0.034	0.034	0.031
09-Jul-88	09-Jul-88	429	3.161	2.728	3.261	0.037	0.039	0.043	0.040
03-Nov-88	04-Nov-88	546	3.216	2.773	3.309	0.053	0.052	0.057	0.054
04-May-89	06-May-89	728	3.204	2.760	3.299	0.049	0.048	0.054	0.051

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
08-May-87	08-May-87	1	3.231	2.760	3.094	0.000	0.000	0.000	0.000
14-May-87	14-May-87	7	3.251	2.779	3.115	0.006	0.005	0.006	0.006
21-May-87	21-May-87	14	3.249	2.777	3.115	0.005	0.005	0.006	0.005
04-Jun-87	04-Jun-87	28	3.259	2.793	3.129	0.008	0.009	0.010	0.009
02-Jul-87	02-Jul-87	56	3.354	2.903	3.224	0.035	0.041	0.037	0.037
30-Jul-87	30-Jul-87	84	3.573	3.113	3.436	0.097	0.100	0.097	0.098
27-Aug-87	27-Aug-87	112	3.748	3.266	3.592	0.147	0.143	0.141	0.144
22-Oct-87	22-Oct-87	168	3.918	3.440	3.756	0.195	0.193	0.188	0.192
04-Feb-88	04-Feb-88	273	3.989	3.559	3.871	0.215	0.226	0.220	0.221
06-May-88	06-May-88	365	3.990	3.572	3.867	0.215	0.230	0.219	0.221
09-Jul-88	09-Jul-88	429	3.996	3.585	3.873	0.217	0.234	0.221	0.224
03-Nov-88	04-Nov-88	546	4.029	3.618	3.904	0.226	0.243	0.230	0.233
04-May-89	06-May-89	728	4.022	3.613	3.898	0.224	0.242	0.228	0.231

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CG2 CSA 23.2-14A

Rock Type: Control-Sudbury Gravel

Locality: Sudbury

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	06-May-87	Bin 28	0.94	23	
2A,B,C	06-May-87	Box CG2-2	0.94	38	
3A,B,C	14-May-87	Bin 28	1.25	23	352.806 mm
4A,B,C	14-May-87	Box CG2-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
07-May-87	07-May-87	1	3.185	2.847	3.156	0.000	0.000	0.000	0.000
13-May-87	13-May-87	7	3.172	2.835	3.147	-0.004	-0.003	-0.003	-0.003
20-May-87	20-May-87	14	3.171	2.831	3.143	-0.004	-0.005	-0.004	-0.004
03-Jun-87	03-Jun-87	28	3.170	2.832	3.145	-0.004	-0.004	-0.003	-0.004
01-Jul-87	01-Jul-87	56	3.176	2.834	3.148	-0.003	-0.004	-0.002	-0.003
29-Jul-87	29-Jul-87	84	3.174	2.842	3.151	-0.003	-0.001	-0.001	-0.002
26-Aug-87	26-Aug-87	112	3.165	2.830	3.141	-0.006	-0.005	-0.004	-0.005
21-Oct-87	21-Oct-87	168	3.180	2.844	3.160	-0.001	-0.001	0.001	.000
03-Feb-88	03-Feb-88	273	3.193	2.851	3.163	0.002	0.001	0.002	0.002
04-May-88	05-May-88	364	3.189	2.851	3.172	0.001	0.001	0.005	0.002
02-Nov-88	03-Nov-88	546	3.209	2.875	3.184	0.007	0.008	0.008	0.008
04-May-89	05-May-89	729	3.198	2.860	3.167	0.004	0.004	0.003	0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
07-May-87	07-May-87	1	2.821	2.974	3.462	0.000	0.000	0.000	0.000
13-May-87	13-May-87	7	2.807	2.958	3.445	-0.004	-0.005	-0.005	-0.004
20-May-87	20-May-87	14	2.806	2.953	3.444	-0.004	-0.006	-0.005	-0.005
03-Jun-87	03-Jun-87	28	2.810	2.960	3.449	-0.003	-0.004	-0.004	-0.004
01-Jul-87	01-Jul-87	56	2.825	2.973	3.459	0.001	.000	-0.001	.000
29-Jul-87	29-Jul-87	84	2.819	2.963	3.457	-0.001	-0.003	-0.001	-0.002
26-Aug-87	26-Aug-87	112	2.813	2.958	3.451	-0.002	-0.005	-0.003	-0.003
21-Oct-87	21-Oct-87	168	2.827	2.975	3.470	0.002	.000	0.002	0.001
03-Feb-88	03-Feb-88	273	2.842	2.989	3.484	0.006	0.004	0.006	0.005
04-May-88	05-May-88	364	2.839	2.984	3.477	0.005	0.003	0.004	0.004
02-Nov-88	03-Nov-88	546	2.862	3.014	3.503	0.012	0.011	0.012	0.012
04-May-89	05-May-89	729	2.845	2.996	3.489	0.007	0.006	0.008	0.007

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CG2 CSA 23.2-14A

Rock Type: Control-Sudbury Gravel

Locality: Sudbury

Dates Cast:

			Alk %	Temp C
1A,B,C	06-May-87	Bin 28	0.94	23
2A,B,C	06-May-87	Box CG2-2	0.94	38
3A,B,C	14-May-87	Bin 28	1.25	23
4A,B,C	14-May-87	Box CG2-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
15-May-87	15-May-87	1	3.329	4.083	4.004	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.335	4.087	4.007	0.002	0.001	0.001	0.001
28-May-87	28-May-87	14	3.329	4.080	4.003	0.000	-0.001	.000	.000
11-Jun-87	11-Jun-87	28	3.341	4.090	4.012	0.003	0.002	0.002	0.003
09-Jul-87	09-Jul-87	56	3.329	4.080	4.000	0.000	-0.001	-0.001	-0.001
06-Aug-87	06-Aug-87	84	3.340	4.091	4.015	0.003	0.002	0.003	0.003
03-Sep-87	03-Sep-87	112	3.344	4.095	4.015	0.004	0.003	0.003	0.004
29-Oct-87	29-Oct-87	168	3.339	4.093	4.001	0.003	0.003	-0.001	0.002
12-Feb-88	11-Feb-88	274	3.356	4.107	4.020	0.008	0.007	0.005	0.006
13-May-88	13-May-88	365	3.353	4.106	4.027	0.007	0.007	0.007	0.007
10-Nov-88	11-Nov-88	546	3.380	4.126	4.046	0.014	0.012	0.012	0.013
11-May-89	13-May-89	728	3.370	4.119	4.041	0.012	0.010	0.010	0.011

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
15-May-87	15-May-87	1	3.695	3.805	3.701	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.696	3.804	3.703	.000	.000	0.001	.000
28-May-87	28-May-87	14	3.690	3.810	3.703	-0.001	0.001	0.001	.000
11-Jun-87	11-Jun-87	28	3.698	3.812	3.707	0.001	0.002	0.002	0.002
09-Jul-87	09-Jul-87	56	3.693	3.807	3.707	-0.001	0.001	0.002	0.001
06-Aug-87	06-Aug-87	84	3.712	3.823	3.718	0.005	0.005	0.005	0.005
03-Sep-87	03-Sep-87	112	3.721	3.828	3.731	0.007	0.007	0.009	0.007
29-Oct-87	29-Oct-87	168	3.728	3.838	3.744	0.009	0.009	0.012	0.010
13-Feb-88	11-Feb-88	275	3.743	3.858	3.762	0.014	0.015	0.017	0.015
12-May-88	13-May-88	364	3.735	3.859	3.751	0.011	0.015	0.014	0.014
10-Nov-88	11-Nov-88	546	3.772	3.894	3.783	0.022	0.025	0.023	0.023
11-May-89	13-May-89	728	3.762	3.886	3.781	0.019	0.023	0.023	0.022

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CR3 CSA 23.2-14A

Rock Type: Control-Nelson

Locality: Nelson

Dates Cast:

			Alk %	Temp C
1A,B,C	07-May-87	Bin 29	0.94	23
2A,B,C	07-May-87	Box CR3-2	0.94	38
3A,B,C	07-May-87	Bin 29	1.25	23
4A,B,C	07-May-87	Box CR3-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
08-May-87	08-May-87	1	3.018	3.170	3.122	0.000	0.000	0.000	0.000
14-May-87	14-May-87	7	3.004	3.168	3.132	-0.004	-0.001	0.003	-0.001
21-May-87	21-May-87	14	3.006	3.167	3.125	-0.003	-0.001	0.001	-0.001
04-Jun-87	04-Jun-87	28	3.009	3.168	3.124	-0.003	-0.001	0.001	-0.001
02-Jul-87	02-Jul-87	56	3.018	3.180	3.142	0.000	0.003	0.006	0.003
30-Jul-87	30-Jul-87	84	3.000	3.166	3.124	-0.005	-0.001	0.001	-0.002
27-Aug-87	27-Aug-87	112	3.006	3.167	3.131	-0.003	-0.001	0.003	-0.001
22-Oct-87	22-Oct-87	168	3.016	3.182	3.142	-0.001	0.003	0.006	0.003
04-Feb-88	04-Feb-88	273	3.031	3.195	3.155	0.004	0.007	0.009	0.007
05-May-88	06-May-88	364	3.021	3.189	3.147	0.001	0.005	0.007	0.004
03-Nov-88	04-Nov-88	546	3.042	3.207	3.166	0.007	0.010	0.012	0.010
04-May-89	06-May-89	728	3.039	3.205	3.162	0.006	0.010	0.011	0.009

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
08-May-87	08-May-87	1	3.439	2.883	2.834	0.000	0.000	0.000	0.000
14-May-87	14-May-87	7	3.458	2.900	2.851	0.005	0.005	0.005	0.005
21-May-87	21-May-87	14	3.456	2.899	2.849	0.005	0.005	0.004	0.005
04-Jun-87	04-Jun-87	28	3.458	2.899	2.848	0.005	0.005	0.004	0.005
02-Jul-87	02-Jul-87	56	3.473	2.914	2.865	0.010	0.009	0.009	0.009
30-Jul-87	30-Jul-87	84	3.464	2.896	2.855	0.007	0.004	0.006	0.006
27-Aug-87	27-Aug-87	112	3.466	2.897	2.853	0.008	0.004	0.005	0.006
22-Oct-87	22-Oct-87	168	3.478	2.910	2.872	0.011	0.008	0.011	0.010
04-Feb-88	04-Feb-88	273	3.498	2.926	2.884	0.017	0.012	0.014	0.014
05-May-88	06-May-88	364	3.477	2.910	2.870	0.011	0.008	0.010	0.010
03-Nov-88	04-Nov-88	546	3.520	2.950	2.909	0.023	0.019	0.021	0.021
04-May-89	06-May-89	728	3.504	2.938	2.897	0.018	0.016	0.018	0.017

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	CR3	CSA 23.2-14A
Rock Type:	Control-Nelson	
Locality:	Nelson	

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	07-May-87	Bin 29	0.94	23	
2A,B,C	07-May-87	Box CR3-2	0.94	38	
3A,B,C	07-May-87	Bin 29	1.25	23	352.806 mm
4A,B,C	07-May-87	Box CR3-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
08-May-87	08-May-87	1	2.620	2.764	2.850	0.000	0.000	0.000	0.000
14-May-87	14-May-87	7	2.620	2.761	2.846	0.000	-0.001	-0.001	-0.001
21-May-87	21-May-87	14	2.618	2.764	2.846	-0.001	0.000	-0.001	-0.001
04-Jun-87	04-Jun-87	28	2.622	2.769	2.852	0.001	0.001	0.001	0.001
02-Jul-87	02-Jul-87	56	2.634	2.782	2.863	0.004	0.005	0.004	0.004
30-Jul-87	30-Jul-87	84	2.618	2.765	2.840	-0.001	.000	-0.003	-0.001
27-Aug-87	27-Aug-87	112	2.622	2.771	2.853	0.001	0.002	0.001	0.001
22-Oct-87	22-Oct-87	168	2.637	2.787	2.870	0.005	0.007	0.006	0.006
04-Feb-88	04-Feb-88	273	2.646	2.793	2.881	0.007	0.008	0.009	0.008
05-May-88	06-May-88	364	2.647	2.789	2.872	0.008	0.007	0.006	0.007
03-Nov-88	04-Nov-88	546	2.672	2.818	2.902	0.015	0.015	0.015	0.015
04-May-89	06-May-89	728	2.664	2.812	2.896	0.012	0.014	0.013	0.013

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
08-May-87	08-May-87	1	3.588	2.893	3.287	0.000	0.000	0.000	0.000
04-Apr-87	14-May-87	7	3.595	2.898	3.293	0.002	0.001	0.002	0.002
21-May-87	21-May-87	14	3.597	2.899	3.295	0.003	0.002	0.002	0.002
04-Jun-87	04-Jun-87	28	3.600	2.903	3.301	0.003	0.003	0.004	0.003
02-Jul-87	02-Jul-87	56	3.616	2.917	3.316	0.008	0.007	0.008	0.008
30-Jul-87	30-Jul-87	84	3.611	2.914	3.300	0.007	0.006	0.004	0.005
27-Aug-87	27-Aug-87	112	3.604	2.910	3.307	0.005	0.005	0.006	0.005
22-Oct-87	22-Oct-87	168	3.625	2.930	3.325	0.010	0.010	0.011	0.011
04-Feb-88	04-Feb-88	273	3.636	2.934	3.333	0.014	0.012	0.013	0.013
05-May-88	06-May-88	364	3.629	2.930	3.329	0.012	0.010	0.012	0.011
03-Nov-88	04-Nov-88	546	3.662	2.965	3.362	0.021	0.020	0.021	0.021
04-May-89	06-May-89	728	3.654	2.960	3.351	0.019	0.019	0.018	0.019

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CR4 CSA A23.2-14A

Rock Type: Control-Pittsburgh Limestone

Locality: Pittsburgh

Dates Cast:

			Alk %	Temp C
1A,B,C	02-Apr-87	Bin 4	0.94	23
2A,B,C	02-Apr-87	Box CR4-2	0.94	38
3A,B,C	01-Apr-87	Bin 4	1.25	23
4A,B,C	01-Apr-87	Box CR4-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
03-Apr-87	03-Apr-87	1	2.052	2.765	2.734	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.090	2.801	2.771	0.011	0.010	0.010	0.010
16-Apr-87	16-Apr-87	14	2.099	2.806	2.780	0.013	0.012	0.013	0.013
30-Apr-87	30-Apr-87	28	2.140	2.853	2.824	0.025	0.025	0.026	0.025
28-May-87	28-May-87	56	2.155	2.869	2.830	0.029	0.029	0.027	0.029
25-Jun-87	25-Jun-87	84	2.198	2.922	2.874	0.041	0.045	0.040	0.042
23-Jul-87	23-Jul-87	112	2.232	2.947	2.897	0.051	0.052	0.046	0.050
17-Sep-87	17-Sep-87	168	2.266	2.988	2.926	0.061	0.063	0.054	0.059
14-Jan-88	14-Jan-88	287	2.385	3.091	3.023	0.094	0.092	0.082	0.090
06-Apr-88	01-Apr-88	370	2.423	3.120	3.054	0.105	0.101	0.091	0.099
29-Sep-88	30-Sep-88	546	2.494	3.186	3.114	0.125	0.119	0.108	0.117
31-Mar-89	01-Apr-89	729	2.516	3.202	3.128	0.132	0.124	0.112	0.122

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
03-Apr-87	03-Apr-87	1	2.773	2.363	3.140	0.000	0.000	0.000	0.000
09-Apr-87	09-Apr-87	7	2.824	2.416	3.195	0.014	0.015	0.016	0.015
16-Apr-87	16-Apr-87	14	2.868	2.465	3.241	0.027	0.029	0.029	0.028
30-Apr-87	30-Apr-87	28	2.971	2.564	3.340	0.056	0.057	0.057	0.057
28-May-87	28-May-87	56	3.103	2.695	3.460	0.094	0.094	0.091	0.093
25-Jun-87	25-Jun-87	84	3.237	2.815	3.573	0.132	0.128	0.123	0.127
23-Jul-87	23-Jul-87	112	3.311	2.902	3.592	0.152	0.153	0.128	0.144
17-Sep-87	17-Sep-87	168	3.451	3.053	3.777	0.192	0.196	0.181	0.189
14-Jan-88	14-Jan-88	287	3.629	3.265	3.953	0.243	0.256	0.230	0.243
31-Mar-88	01-Apr-88	364	3.617	3.284	3.954	0.239	0.261	0.231	0.244
29-Sep-88	30-Sep-88	546	3.802	3.499	4.139	0.292	0.322	0.283	0.299
31-Mar-89	01-Apr-89	729	3.886	3.606	4.229	0.315	0.352	0.309	0.325

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: CR4 CSA A23.2-14A

Rock Type: Control-Pittsburgh Limestone

Locality: Pittsburgh

Dates Cast:

			Alk %	Temp C
1A,B,C	02-Apr-87	Bin 4	0.94	23
2A,B,C	02-Apr-87	Box CR4-2	0.94	38
3A,B,C	01-Apr-87	Bin 4	1.25	23
4A,B,C	01-Apr-87	Box CR4-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
02-Apr-87	02-Apr-87	1	1.582	1.630	3.310	0.000	0.000	0.000	0.000
08-Apr-87	08-Apr-87	7	1.625	1.674	3.354	0.012	0.012	0.012	0.012
15-Apr-87	15-Apr-87	14	1.654	1.701	3.379	0.020	0.020	0.020	0.020
29-Apr-87	29-Apr-87	28	1.690	1.749	3.425	0.031	0.034	0.033	0.032
27-May-87	27-May-87	56	1.752	1.829	3.492	0.048	0.056	0.052	0.052
24-Jun-87	24-Jun-87	84	1.826	1.912	3.565	0.069	0.080	0.072	0.074
22-Jul-87	22-Jul-87	112	1.874	1.970	3.610	0.083	0.096	0.085	0.088
16-Sep-87	16-Sep-87	168	1.944	2.047	3.673	0.103	0.118	0.103	0.108
13-Jan-88	13-Jan-88	287	2.036	2.154	3.761	0.129	0.149	0.128	0.135
30-Mar-88	31-Mar-88	364	2.067	2.190	3.785	0.137	0.159	0.135	0.144
28-Sep-88	29-Sep-88	546	2.134	2.264	3.845	0.156	0.180	0.152	0.163
29-Mar-89	31-Mar-89	728	2.171	2.307	3.884	0.167	0.192	0.163	0.174

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
02-Apr-87	02-Apr-87	1	2.485	2.481	2.814	0.000	0.000	0.000	0.000
04-Apr-87	08-Apr-87	3	2.567	2.560	2.894	0.023	0.022	0.023	0.023
15-Apr-87	15-Apr-87	14	2.634	2.623	2.955	0.042	0.040	0.040	0.041
29-Apr-87	29-Apr-87	28	2.755	2.744	3.084	0.077	0.075	0.077	0.076
27-May-87	27-May-87	56	2.908	2.900	3.242	0.120	0.119	0.121	0.120
24-Jun-87	24-Jun-87	84	3.024	3.024	3.375	0.153	0.154	0.159	0.155
22-Jul-87	22-Jul-87	112	3.094	3.102	3.456	0.173	0.176	0.182	0.177
16-Sep-87	16-Sep-87	168	3.171	3.194	3.560	0.194	0.202	0.211	0.203
13-Jan-88	13-Jan-88	287	3.291	3.337	3.729	0.228	0.243	0.259	0.243
30-Mar-88	31-Mar-88	364	3.325	3.373	3.779	0.238	0.253	0.274	0.255
28-Sep-88	29-Sep-88	546	3.391	3.452	3.876	0.257	0.275	0.301	0.278
29-Mar-89	31-Mar-89	728	3.426	3.493	3.924	0.267	0.287	0.315	0.289

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G1 CSA 23.2-14A

Rock Type: Gravel

Locality: Viel

Dates Cast:			Alk %	Temp C
1A,B,C	08-May-87	Bin 30	0.94	23
2A,B,C	08-May-87	Box G1-2	0.94	38
3A,B,C	11-May-87	Bin 30	1.25	23
4A,B,C	11-May-87	Box G1-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
09-May-87	09-May-87	1	2.884	3.334	2.906	0.000	0.000	0.000	0.000
15-May-87	15-May-87	7	2.876	3.333	2.912	-0.002	.000	0.002	.000
22-May-87	22-May-87	14	2.889	3.336	2.913	0.001	0.001	0.002	0.001
05-Jun-87	05-Jun-87	28	2.893	3.341	2.917	0.003	0.002	0.003	0.003
03-Jul-87	03-Jul-87	56	2.894	3.339	2.917	0.003	0.001	0.003	0.002
31-Jul-87	31-Jul-87	84	2.895	3.343	2.916	0.003	0.003	0.003	0.003
28-Aug-87	28-Aug-87	112	2.881	3.328	2.905	-0.001	-0.002	.000	-0.001
23-Oct-87	23-Oct-87	168	2.914	3.355	2.933	0.009	0.006	0.008	0.007
05-Feb-88	05-Feb-88	273	2.898	3.345	2.922	0.004	0.003	0.005	0.004
06-May-88	07-May-88	364	2.892	3.341	2.919	0.002	0.002	0.004	0.003
05-Nov-88	05-Nov-88	547	2.925	3.373	2.947	0.012	0.011	0.012	0.011
04-May-89	07-May-89	727	2.915	3.356	2.926	0.009	0.006	0.006	0.007

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
09-May-87	09-May-87	1	3.501	3.532	3.053	0.000	0.000	0.000	0.000
15-May-87	15-May-87	7	3.505	3.534	3.051	0.001	0.001	-0.001	.000
22-May-87	22-May-87	14	3.501	3.534	3.049	0.000	0.001	-0.001	.000
05-Jun-87	05-Jun-87	28	3.513	3.540	3.058	0.003	0.002	0.001	0.002
03-Jul-87	03-Jul-87	56	3.504	3.534	3.052	0.001	0.001	.000	.000
31-Jul-87	31-Jul-87	84	3.511	3.543	3.058	0.003	0.003	0.001	0.002
28-Aug-87	28-Aug-87	112	3.506	3.534	3.053	0.001	0.001	0.000	0.001
23-Oct-87	23-Oct-87	168	3.532	3.561	3.074	0.009	0.008	0.006	0.008
05-Feb-88	05-Feb-88	273	3.525	3.561	3.069	0.007	0.008	0.005	0.007
06-May-88	07-May-88	364	3.512	3.542	3.059	0.003	0.003	0.002	0.003
05-Nov-88	05-Nov-88	547	3.547	3.578	3.093	0.013	0.013	0.011	0.012
01-May-89	07-May-89	724	3.544	3.575	3.092	0.012	0.012	0.011	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G1 CSA 23.2-14A

Rock Type: Gravel

Locality: Viel

Dates Cast:

			Alk %	Temp C	Sample Lengths:
1A,B,C	08-May-87	Bin 30	0.94	23	
2A,B,C	08-May-87	Box G1-2	0.94	38	
3A,B,C	11-May-87	Bin 30	1.25	23	352.306 mm
4A,B,C	11-May-87	Box G1-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
12-May-87	12-May-87	1	2.949	3.119	2.932	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	2.946	3.118	2.931	-0.001	.000	.000	.000
25-May-87	25-May-87	14	2.962	3.134	2.949	0.004	0.004	0.005	0.004
08-Jun-87	08-Jun-87	28	2.947	3.119	2.932	-0.001	0.000	0.000	.000
06-Jul-87	06-Jul-87	56	2.950	3.120	2.935	.000	.000	0.001	.000
03-Aug-87	03-Aug-87	84	2.955	3.131	2.942	0.002	0.003	0.003	0.003
31-Aug-87	31-Aug-87	112	2.926	3.099	2.912	-0.007	-0.006	-0.006	-0.006
26-Oct-87	26-Oct-87	168	2.934	3.106	2.915	-0.004	-0.004	-0.005	-0.004
08-Feb-88	08-Feb-88	273	2.942	3.112	2.932	-0.002	-0.002	0.000	-0.001
09-May-88	10-May-88	364	2.966	3.137	2.948	0.005	0.005	0.005	0.005
08-Nov-88	08-Nov-88	547	2.970	3.143	2.957	0.006	0.007	0.007	0.007
04-May-89	10-May-89	724	2.963	3.142	2.962	0.004	0.007	0.009	0.006

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
12-May-87	12-May-87	1	2.782	2.759	3.186	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	2.785	2.766	3.185	0.001	0.002	.000	0.001
25-May-87	25-May-87	14	2.797	2.776	3.197	0.004	0.005	0.003	0.004
08-Jun-87	08-Jun-87	28	2.786	2.764	3.186	0.001	0.001	0.000	0.001
06-Jul-87	06-Jul-87	56	2.792	2.772	3.190	0.003	0.004	0.001	0.003
03-Aug-87	03-Aug-87	84	2.791	2.773	3.194	0.003	0.004	0.002	0.003
31-Aug-87	31-Aug-87	112	2.766	2.748	3.167	-0.005	-0.003	-0.005	-0.004
26-Oct-87	26-Oct-87	168	2.774	2.752	3.174	-0.002	-0.002	-0.003	-0.003
08-Feb-88	08-Feb-88	273	2.782	2.760	3.178	0.000	.000	-0.002	-0.001
09-May-88	10-May-88	364	2.813	2.794	3.210	0.009	0.010	0.007	0.009
08-Nov-88	08-Nov-88	547	2.821	2.807	3.225	0.011	0.014	0.011	0.012
01-May-89	10-May-89	721	2.835	2.818	3.239	0.015	0.017	0.015	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G2 CSA 23.2-14A

Rock Type: Gravel

Locality: Restigouche

Dates Cast:			Alk %	Temp C
1A,B,C	11-May-87	Bin 31	0.94	23
2A,B,C	11-May-87	Box G2-2	0.94	38
3A,B,C	11-May-87	Bin 31	1.25	23
4A,B,C	11-May-87	Box G2-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
12-May-87	12-May-87	1	2.923	2.992	2.980	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	2.910	2.985	2.970	-0.004	-0.002	-0.003	-0.003
25-May-87	25-May-87	14	2.932	3.003	2.992	0.003	0.003	0.003	0.003
08-Jun-87	08-Jun-87	28	2.913	2.982	2.971	-0.003	-0.003	-0.003	-0.003
06-Jul-87	06-Jul-87	56	2.919	2.986	2.975	-0.001	-0.002	-0.001	-0.001
03-Aug-87	03-Aug-87	84	2.925	2.995	2.978	0.001	0.001	-0.001	.000
31-Aug-87	31-Aug-87	112	2.889	2.955	2.945	-0.010	-0.010	-0.010	-0.010
26-Oct-87	26-Oct-87	168	2.898	2.966	2.954	-0.007	-0.007	-0.007	-0.007
08-Feb-88	08-Feb-88	273	2.908	2.973	2.962	-0.004	-0.005	-0.005	-0.005
09-May-88	10-May-88	364	2.930	2.996	2.979	0.002	0.001	.000	0.001
08-Nov-88	08-Nov-88	547	2.939	3.005	2.992	0.005	0.004	0.003	0.004
08-May-89	10-May-89	728	2.938	3.001	2.988	0.004	0.003	0.002	0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
12-May-87	12-May-87	1	3.102	3.090	3.058	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	3.085	3.083	3.054	-0.005	-0.002	-0.001	-0.003
25-May-87	25-May-87	14	3.101	3.092	3.063	.000	0.001	0.001	0.001
08-Jun-87	08-Jun-87	28	3.090	3.087	3.056	-0.003	-0.001	-0.001	-0.002
06-Jul-87	06-Jul-87	56	3.095	3.090	3.058	-0.002	0.000	0.000	-0.001
03-Aug-87	03-Aug-87	84	3.095	3.086	3.062	-0.002	-0.001	0.001	-0.001
31-Aug-87	31-Aug-87	112	3.073	3.060	3.034	-0.008	-0.009	-0.007	-0.008
26-Oct-87	26-Oct-87	168	3.070	3.066	3.037	-0.009	-0.007	-0.006	-0.007
08-Feb-88	08-Feb-88	273	3.085	3.075	3.044	-0.005	-0.004	-0.004	-0.004
09-May-88	10-May-88	364	3.106	3.098	3.069	0.001	0.002	0.003	0.002
09-Nov-88	08-Nov-88	548	3.118	3.119	3.083	0.005	0.008	0.007	0.007
10-May-89	10-May-89	730	3.115	3.112	3.079	0.004	0.006	0.006	0.005

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	G2	CSA 23.2-14A
Rock Type:	Gravel	
Locality:	Restigouche	

	Dates Cast:		Alk %	Temp C
1A,B,C	11-May-87	Bin 31	0.94	23
2A,B,C	11-May-87	Box G2-2	0.94	38
3A,B,C	11-May-87	Bin 31	1.25	23
4A,B,C	11-May-87	Box G2-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
12-May-87	12-May-87	1	2.968	2.334	3.388	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	2.964	2.333	3.386	-0.001	.000	-0.001	-0.001
25-May-87	25-May-87	14	2.983	2.353	3.405	0.004	0.005	0.005	0.005
08-Jun-87	08-Jun-87	28	2.967	2.339	3.393	.000	0.001	0.001	0.001
06-Jul-87	06-Jul-87	56	2.972	2.341	3.395	0.001	0.002	0.002	0.002
03-Aug-87	03-Aug-87	84	2.977	2.348	3.402	0.003	0.004	0.004	0.003
31-Aug-87	31-Aug-87	112	2.950	2.322	3.374	-0.005	-0.003	-0.004	-0.004
26-Oct-87	26-Oct-87	168	2.967	2.336	3.393	.000	0.001	0.001	0.001
08-Feb-88	08-Feb-88	273	2.965	2.336	3.387	-0.001	0.001	.000	.000
09-May-88	10-May-88	364	2.985	2.357	3.406	0.005	0.007	0.005	0.005
09-Nov-88	08-Nov-88	548	2.999	2.372	3.413	0.009	0.011	0.007	0.009
08-May-89	10-May-89	728	2.994	2.365	3.419	0.007	0.009	0.009	0.008

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
12-May-87	12-May-87	1	2.535	2.879	2.448	0.000	0.000	0.000	0.000
18-May-87	18-May-87	7	2.530	2.870	2.442	-0.001	-0.003	-0.002	-0.002
25-May-87	25-May-87	14	2.547	2.891	2.462	0.003	0.003	0.004	0.004
08-Jun-87	08-Jun-87	28	2.537	2.878	2.450	0.001	.000	0.001	.000
06-Jul-87	06-Jul-87	56	2.542	2.883	2.455	0.002	0.001	0.002	0.002
03-Aug-87	03-Aug-87	84	2.540	2.886	2.457	0.001	0.002	0.003	0.002
31-Aug-87	31-Aug-87	112	2.515	2.860	2.428	-0.006	-0.005	-0.006	-0.006
26-Oct-87	26-Oct-87	168	2.514	2.862	2.432	-0.006	-0.005	-0.005	-0.005
08-Feb-88	08-Feb-88	273	2.532	2.876	2.449	-0.001	-0.001	.000	.000
09-May-88	10-May-88	364	2.555	2.900	2.463	0.006	0.006	0.004	0.005
09-Nov-88	08-Nov-88	548	2.571	2.920	2.480	0.010	0.012	0.009	0.010
10-May-89	10-May-89	730	2.570	2.916	2.480	0.010	0.010	0.009	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G3 CSA 23.2-14A

Rock Type: Gravel

Locality: McCain

Dates Cast:

Dates Cast			Alk %	Temp C
1A,B,C	12-May-87	Bin 32	0.94	23
2A,B,C	12-May-87	Box G3-2	0.94	38
3A,B,C	12-May-87	Bin 32	1.25	23
4A,B,C	12-May-87	Box G3-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
13-May-87	13-May-87	1	3.229	2.914	2.703	0.000	0.000	0.000	0.000
19-May-87	19-May-87	7	3.211	2.900	2.689	-0.005	-0.004	-0.004	-0.004
26-May-87	26-May-87	14	3.213	2.896	2.687	-0.005	-0.005	-0.005	-0.005
09-Jun-87	09-Jun-87	28	3.219	2.905	2.695	-0.003	-0.003	-0.002	-0.003
07-Jul-87	07-Jul-87	56	3.210	2.896	2.687	-0.005	-0.005	-0.005	-0.005
04-Aug-87	04-Aug-87	84	3.219	2.903	2.696	-0.003	-0.003	-0.002	-0.003
01-Sep-87	01-Sep-87	112	3.206	2.892	2.680	-0.007	-0.006	-0.007	-0.006
27-Oct-87	27-Oct-87	168	3.198	2.885	2.673	-0.009	-0.008	-0.009	-0.009
09-Feb-88	09-Feb-88	273	3.252	2.934	2.725	0.007	0.006	0.006	0.006
10-May-88	11-May-88	364	3.218	2.905	2.697	-0.003	-0.003	-0.002	-0.002
09-Nov-88	09-Nov-88	547	3.255	2.938	2.729	0.007	0.007	0.007	0.007
05-May-89	11-May-89	724	3.235	2.917	2.709	0.002	0.001	0.002	0.001

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
13-May-87	13-May-87	1	2.647	2.772	2.905	0.000	0.000	0.000	0.000
19-May-87	19-May-87	7	2.623	2.746	2.883	-0.007	-0.007	-0.006	-0.007
26-May-87	26-May-87	14	2.630	2.760	2.889	-0.005	-0.003	-0.005	-0.004
09-Jun-87	09-Jun-87	28	2.639	2.767	2.895	-0.002	-0.001	-0.003	-0.002
07-Jul-87	07-Jul-87	56	2.632	2.762	2.893	-0.004	-0.003	-0.003	-0.003
04-Aug-87	04-Aug-87	84	2.627	2.761	2.886	-0.006	-0.003	-0.005	-0.005
01-Sep-87	01-Sep-87	112	2.623	2.755	2.880	-0.007	-0.005	-0.007	-0.006
27-Oct-87	27-Oct-87	168	2.623	2.750	2.875	-0.007	-0.006	-0.009	-0.007
09-Feb-88	09-Feb-88	273	2.669	2.796	2.928	0.006	0.007	0.007	0.007
10-May-88	11-May-88	364	2.638	2.769	2.894	-0.003	-0.001	-0.003	-0.002
09-Nov-88	09-Nov-88	547	2.666	2.787	2.920	0.005	0.004	0.004	0.005
05-May-89	11-May-89	724	2.658	2.775	2.906	0.003	0.001	.000	0.001

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G3 CSA 23.2-14A

Rock Type: Gravel

Locality: McCain

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	12-May-87	Bin 32	0.94	23	
2A,B,C	12-May-87	Box G3-2	0.94	38	
3A,B,C	12-May-87	Bin 32	1.25	23	352.806 mm
4A,B,C	12-May-87	Box G3-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
13-May-87	13-May-87	1	3.549	2.907	3.789	0.000	0.000	0.000	0.000
19-May-87	19-May-87	7	3.564	2.919	3.801	0.004	0.003	0.003	0.004
26-May-87	26-May-87	14	3.565	2.920	3.800	0.005	0.004	0.003	0.004
09-Jun-87	09-Jun-87	28	3.571	2.925	3.806	0.006	0.005	0.005	0.005
07-Jul-87	07-Jul-87	56	3.567	2.920	3.799	0.005	0.004	0.003	0.004
04-Aug-87	04-Aug-87	84	3.576	2.924	3.807	0.008	0.005	0.005	0.006
01-Sep-87	01-Sep-87	112	3.563	2.917	3.802	0.004	0.003	0.004	0.003
27-Oct-87	27-Oct-87	168	3.550	2.915	3.790	.000	0.002	.000	0.001
09-Feb-88	09-Feb-88	273	3.603	2.962	3.838	0.015	0.016	0.014	0.015
10-May-88	11-May-88	364	3.571	2.934	3.810	0.006	0.008	0.006	0.007
10-Nov-88	09-Nov-88	548	3.605	2.963	3.841	0.016	0.016	0.015	0.015
05-May-89	11-May-89	724	3.593	2.950	3.827	0.012	0.012	0.011	0.012

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
13-May-87	13-May-87	1	3.245	3.660	2.856	0.000	0.000	0.000	0.000
19-May-87	19-May-87	7	3.253	3.673	2.862	0.002	0.004	0.002	0.003
26-May-87	26-May-87	14	3.253	3.674	2.862	0.002	0.004	0.002	0.003
09-Jun-87	09-Jun-87	28	3.260	3.674	2.865	0.004	0.004	0.003	0.004
07-Jul-87	07-Jul-87	56	3.261	3.674	2.862	0.005	0.004	0.002	0.003
04-Aug-87	04-Aug-87	84	3.258	3.670	2.860	0.004	0.003	0.001	0.003
01-Sep-87	01-Sep-87	112	3.257	3.672	2.860	0.003	0.003	0.001	0.003
27-Oct-87	27-Oct-87	168	3.243	3.663	2.850	-0.001	0.001	-0.002	.000
09-Feb-88	09-Feb-88	273	3.290	3.710	2.901	0.013	0.014	0.013	0.013
10-May-88	11-May-88	364	3.266	3.676	2.867	0.006	0.005	0.003	0.005
09-Nov-88	09-Nov-88	547	3.301	3.711	2.904	0.016	0.014	0.014	0.015
02-May-89	11-May-89	721	3.284	3.697	2.886	0.011	0.010	0.009	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G4 CSA 23.2-14A

Rock Type: Gravel

Locality: Audet

Dates Cast:			Alk	Temp C
1A,B,C	13-May-87	Bin 33	0.94	23
2A,B,C	13-May-87	Box G4-2	0.94	38
3A,B,C	13-May-87	Bin 33	1.25	23
4A,B,C	13-May-87	Box G4-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
14-May-87	14-May-87	1	3.877	2.504	3.829	0.000	0.000	0.000	0.000
20-May-87	20-May-87	7	3.868	2.498	3.827	-0.003	-0.002	-0.001	-0.002
27-May-87	27-May-87	14	3.864	2.493	3.818	-0.004	-0.003	-0.003	-0.003
10-Jun-87	10-Jun-87	28	3.869	2.499	3.825	-0.002	-0.001	-0.001	-0.002
08-Jul-87	08-Jul-87	56	3.869	2.497	3.825	-0.002	-0.002	-0.001	-0.002
05-Aug-87	05-Aug-87	84	3.870	2.498	3.829	-0.002	-0.002	0.000	-0.001
02-Sep-87	02-Sep-87	112	3.865	2.489	3.821	-0.003	-0.004	-0.002	-0.003
28-Oct-87	28-Oct-87	168	3.866	2.495	3.824	-0.003	-0.003	-0.001	-0.002
10-Feb-88	10-Feb-88	273	3.887	2.517	3.840	0.003	0.004	0.003	0.003
11-May-88	12-May-88	364	3.874	2.500	3.827	-0.001	-0.001	-0.001	-0.001
10-Nov-88	10-Nov-88	547	3.898	2.529	3.850	0.006	0.007	0.006	0.006
10-May-89	12-May-89	728	3.887	2.516	3.844	0.003	0.003	0.004	0.003

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
14-May-87	14-May-87	1	3.735	3.915	3.464	0.000	0.000	0.000	0.000
20-May-87	20-May-87	7	3.722	3.900	3.449	-0.004	-0.004	-0.004	-0.004
27-May-87	27-May-87	14	3.720	3.894	3.445	-0.004	-0.006	-0.005	-0.005
10-Jun-87	10-Jun-87	28	3.729	3.909	3.454	-0.002	-0.002	-0.003	-0.002
08-Jul-87	08-Jul-87	56	3.726	3.902	3.452	-0.003	-0.004	-0.003	-0.003
05-Aug-87	05-Aug-87	84	3.730	3.906	3.455	-0.001	-0.003	-0.003	-0.002
02-Sep-87	02-Sep-87	112	3.728	3.903	3.452	-0.002	-0.003	-0.003	-0.003
28-Oct-87	28-Oct-87	168	3.725	3.899	3.449	-0.003	-0.005	-0.004	-0.004
10-Feb-88	10-Feb-88	273	3.741	3.920	3.466	0.002	0.001	0.001	0.001
11-May-88	12-May-88	364	3.730	3.906	3.453	-0.001	-0.003	-0.003	-0.002
09-Nov-88	10-Nov-88	546	3.760	3.928	3.475	0.007	0.004	0.003	0.005
10-May-89	12-May-89	728	3.748	3.923	3.475	0.004	0.002	0.003	0.003

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	G4	CSA 23.2-14A
Rock Type:	Gravel	
Locality:	Audet	

Dates Cast:			Alk	Temp C
1A,B,C	13-May-87	Bin 33	0.94	23
2A,B,C	13-May-87	Box G4-2	0.94	38
3A,B,C	13-May-87	Bin 33	1.25	23
4A,B,C	13-May-87	Box G4-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
14-May-87	14-May-87	1	3.292	3.328	3.994	0.000	0.000	0.000	0.000
20-May-87	20-May-87	7	3.299	3.341	4.003	0.002	0.004	0.003	0.003
27-May-87	27-May-87	14	3.294	3.337	3.999	0.001	0.003	0.001	0.002
10-Jun-87	10-Jun-87	28	3.303	3.343	4.004	0.003	0.004	0.003	0.003
08-Jul-87	08-Jul-87	56	3.302	3.344	4.003	0.003	0.005	0.003	0.003
05-Aug-87	05-Aug-87	84	3.306	3.342	4.008	0.004	0.004	0.004	0.004
02-Sep-87	02-Sep-87	112	3.301	3.344	4.003	0.003	0.005	0.003	0.003
28-Oct-87	28-Oct-87	168	3.303	3.346	4.000	0.003	0.005	0.002	0.003
10-Feb-88	10-Feb-88	273	3.320	3.365	4.024	0.008	0.010	0.009	0.009
11-May-88	12-May-88	364	3.308	3.348	4.003	0.005	0.006	0.003	0.004
10-Nov-88	10-Nov-88	547	3.337	3.377	4.036	0.013	0.014	0.012	0.013
10-May-89	12-May-89	728	3.332	3.369	4.028	0.011	0.012	0.010	0.011

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
14-May-87	14-May-87	1	2.519	3.168	3.612	0.000	0.000	0.000	0.000
20-May-87	20-May-87	7	2.528	3.173	3.621	0.003	0.001	0.003	0.002
27-May-87	27-May-87	14	2.527	3.172	3.618	0.002	0.001	0.002	0.002
10-Jun-87	10-Jun-87	28	2.532	3.178	3.625	0.004	0.003	0.004	0.003
08-Jul-87	08-Jul-87	56	2.532	3.181	3.629	0.004	0.004	0.005	0.004
05-Aug-87	05-Aug-87	84	2.537	3.179	3.634	0.005	0.003	0.006	0.005
02-Sep-87	02-Sep-87	112	2.528	3.171	3.620	0.003	0.001	0.002	0.002
28-Oct-87	28-Oct-87	168	2.532	3.176	3.624	0.004	0.002	0.003	0.003
10-Feb-88	10-Feb-88	273	2.551	3.192	3.644	0.009	0.007	0.009	0.008
11-May-88	12-May-88	364	2.537	3.176	3.631	0.005	0.002	0.005	0.004
09-Nov-88	10-Nov-88	546	2.552	3.198	3.649	0.009	0.009	0.010	0.009
10-May-89	12-May-89	728	2.557	3.193	3.640	0.011	0.007	0.008	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample:	G5	CSA 23.2-14A
Rock Type:	Gravel	
Locality:	Porters Cove	

Dates Cast:

			Alk %	Temp C
1A,B,C	14-May-87	Bin 34	0.94	23
2A,B,C	14-May-87	Box G5-2	0.94	38
3A,B,C	14-May-87	Bin 34	1.25	23
4A,B,C	14-May-87	Box G5-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
15-May-87	15-May-87	1	3.607	3.707	3.593	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.607	3.707	3.596	0.000	0.000	0.001	.000
28-May-87	28-May-87	14	3.607	3.705	3.591	0.000	-0.001	-0.001	.000
11-Jun-87	11-Jun-87	28	3.611	3.707	3.596	0.001	0.000	0.001	0.001
09-Jul-87	09-Jul-87	56	3.604	3.698	3.588	-0.001	-0.003	-0.001	-0.002
06-Aug-87	06-Aug-87	84	3.613	3.710	3.600	0.002	0.001	0.002	0.002
03-Sep-87	03-Sep-87	112	3.613	3.711	3.599	0.002	0.001	0.002	0.002
29-Oct-87	29-Oct-87	168	3.608	3.706	3.597	.000	.000	0.001	.000
11-Feb-88	11-Feb-88	273	3.604	3.701	3.589	-0.001	-0.002	-0.001	-0.001
12-May-88	13-May-88	364	3.600	3.696	3.584	-0.002	-0.003	-0.003	-0.003
10-Nov-88	11-Nov-88	546	3.645	3.739	3.627	0.011	0.009	0.010	0.010
11-May-89	13-May-89	728	3.628	3.724	3.616	0.006	0.005	0.007	0.006

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
15-May-87	15-May-87	1	3.228	3.343	2.701	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.226	3.341	2.700	-0.001	-0.001	.000	.000
28-May-87	28-May-87	14	3.226	3.341	2.700	-0.001	-0.001	.000	.000
11-Jun-87	11-Jun-87	28	3.232	3.350	2.706	0.001	0.002	0.001	0.002
09-Jul-87	09-Jul-87	56	3.208	3.326	2.693	-0.006	-0.005	-0.002	-0.004
06-Aug-87	06-Aug-87	84	3.227	3.344	2.705	.000	.000	0.001	.000
03-Sep-87	03-Sep-87	112	3.230	3.346	2.710	0.001	0.001	0.003	0.001
29-Oct-87	29-Oct-87	168	3.206	3.317	2.683	-0.006	-0.007	-0.005	-0.006
11-Feb-88	11-Feb-88	273	3.221	3.339	2.701	-0.002	-0.001	0.000	-0.001
12-May-88	13-May-88	364	3.223	3.336	2.701	-0.001	-0.002	0.000	-0.001
11-Nov-88	11-Nov-88	547	3.263	3.377	2.740	0.010	0.010	0.011	0.010
11-May-89	13-May-89	728	3.248	3.363	2.724	0.006	0.006	0.007	0.006

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G5 CSA 23.2-14A

Rock Type: Gravel

Locality: Porters Cove

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	14-May-87	Bin 34	0.94	23	
2A,B,C	14-May-87	Box G5-2	0.94	38	
3A,B,C	14-May-87	Bin 34	1.25	23	352.806 mm
4A,B,C	14-May-87	Box G5-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
15-May-87	15-May-87	1	3.398	3.170	3.589	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.398	3.170	3.586	0.000	0.000	-0.001	.000
28-May-87	28-May-87	14	3.399	3.169	3.586	.000	.000	-0.001	.000
11-Jun-87	11-Jun-87	28	3.400	3.174	3.589	0.001	0.001	0.000	0.001
09-Jul-87	09-Jul-87	56	3.398	3.169	3.582	0.000	.000	-0.002	-0.001
06-Aug-87	06-Aug-87	84	3.409	3.178	3.593	0.003	0.002	0.001	0.002
03-Sep-87	03-Sep-87	112	3.409	3.179	3.595	0.003	0.003	0.002	0.002
29-Oct-87	29-Oct-87	168	3.407	3.179	3.593	0.003	0.003	0.001	0.002
11-Feb-88	11-Feb-88	273	3.400	3.173	3.584	0.001	0.001	-0.001	.000
12-May-88	13-May-88	364	3.398	3.168	3.581	0.000	-0.001	-0.002	-0.001
11-Nov-88	11-Nov-88	547	3.432	3.203	3.622	0.010	0.009	0.009	0.009
11-May-89	13-May-89	728	3.428	3.203	3.617	0.009	0.009	0.008	0.009

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
15-May-87	15-May-87	1	3.841	2.771	3.530	0.000	0.000	0.000	0.000
21-May-87	21-May-87	7	3.841	2.771	3.531	0.000	0.000	.000	.000
28-May-87	28-May-87	14	3.839	2.772	3.533	-0.001	.000	0.001	.000
11-Jun-87	11-Jun-87	28	3.845	2.781	3.543	0.001	0.003	0.004	0.003
09-Jul-87	09-Jul-87	56	3.831	2.767	3.525	-0.003	-0.001	-0.001	-0.002
06-Aug-87	06-Aug-87	84	3.843	2.784	3.539	0.001	0.004	0.003	0.002
03-Sep-87	03-Sep-87	112	3.843	2.782	3.544	0.001	0.003	0.004	0.003
29-Oct-87	29-Oct-87	168	3.843	2.781	3.539	0.001	0.003	0.003	0.002
11-Feb-88	11-Feb-88	273	3.842	2.781	3.541	.000	0.003	0.003	0.002
12-May-88	13-May-88	364	3.840	2.788	3.539	.000	0.005	0.003	0.002
10-Nov-88	11-Nov-88	546	3.883	2.823	3.580	0.012	0.015	0.014	0.014
11-May-89	13-May-89	728	3.856	2.798	3.557	0.004	0.008	0.008	0.007

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G6 CSA 23.2-14A

Rock Type: Gravel

Locality: Gloucester

Dates Cast:

			Alk %	Temp C
1A,B,C	15-May-87	Bin 35	0.94	23
2A,B,C	15-May-87	Box G6-2	0.94	38
3A,B,C	15-May-87	Bin 35	1.25	23
4A,B,C	15-May-87	Box G6-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
16-May-87	16-May-87	1	3.633	3.888	3.321	0.000	0.000	0.000	0.000
22-May-87	22-May-87	7	3.625	3.882	3.307	-0.002	-0.002	-0.004	-0.003
29-May-87	29-May-87	14	3.630	3.887	3.313	-0.001	.000	-0.002	-0.001
12-Jun-87	12-Jun-87	28	3.631	3.887	3.312	-0.001	.000	-0.003	-0.001
10-Jul-87	10-Jul-87	56	3.634	3.889	3.312	.000	.000	-0.003	-0.001
07-Aug-87	07-Aug-87	84	3.634	3.888	3.314	.000	0.000	-0.002	-0.001
04-Sep-87	04-Sep-87	112	3.631	3.887	3.311	-0.001	.000	-0.003	-0.001
30-Oct-87	30-Oct-87	168	3.634	3.879	3.303	.000	-0.003	-0.005	-0.002
12-Feb-88	12-Feb-88	273	3.646	3.900	3.323	0.004	0.003	0.001	0.003
13-May-88	14-May-88	364	3.638	3.891	3.319	0.001	0.001	-0.001	0.001
11-Nov-88	12-Nov-88	546	3.665	3.920	3.347	0.009	0.009	0.007	0.009
12-May-89	14-May-89	728	3.646	3.902	3.333	0.004	0.004	0.003	0.004

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
16-May-87	16-May-87	1	2.803	3.772	2.696	0.000	0.000	0.000	0.000
22-May-87	22-May-87	7	2.794	3.764	2.691	-0.003	-0.002	-0.001	-0.002
29-May-87	29-May-87	14	2.802	3.772	2.695	.000	0.000	.000	.000
12-Jun-87	12-Jun-87	28	2.800	3.772	2.695	-0.001	0.000	.000	.000
10-Jul-87	10-Jul-87	56	2.773	3.750	2.674	-0.009	-0.006	-0.006	-0.007
07-Aug-87	07-Aug-87	84	2.799	3.771	2.697	-0.001	.000	.000	.000
04-Sep-87	04-Sep-87	112	2.801	3.773	2.703	-0.001	.000	0.002	0.001
30-Oct-87	30-Oct-87	168	2.790	3.762	2.687	-0.004	-0.003	-0.003	-0.003
12-Feb-88	12-Feb-88	273	2.811	3.785	2.712	0.002	0.004	0.005	0.003
13-May-88	14-May-88	364	2.802	3.778	2.707	.000	0.002	0.003	0.002
11-Nov-88	12-Nov-88	546	2.831	3.799	2.724	0.008	0.008	0.008	0.008
12-May-89	14-May-89	728	2.822	3.793	2.717	0.005	0.006	0.006	0.006

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G6 CSA 23.2-14A

Rock Type: Gravel

Locality: Gloucester

Dates Cast:			Alk %	Temp C
1A,B,C	15-May-87	Bin 35	0.94	23
2A,B,C	15-May-87	Box G6-2	0.94	38
3A,B,C	15-May-87	Bin 35	1.25	23
4A,B,C	15-May-87	Box G6-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
16-May-87	16-May-87	1	3.658	2.529	3.751	0.000	0.000	0.000	0.000
22-May-87	22-May-87	7	3.660	2.535	3.758	0.001	0.002	0.002	0.001
29-May-87	29-May-87	14	3.661	2.534	3.755	0.001	0.001	0.001	0.001
12-Jun-87	12-Jun-87	28	3.664	2.536	3.759	0.002	0.002	0.002	0.002
10-Jul-87	10-Jul-87	56	3.661	2.539	3.759	0.001	0.003	0.002	0.002
07-Aug-87	07-Aug-87	84	3.664	2.535	3.760	0.002	0.002	0.003	0.002
04-Sep-87	04-Sep-87	112	3.663	2.538	3.762	0.00	0.003	0.003	0.002
30-Oct-87	30-Oct-87	168	3.664	2.539	3.764	0.002	0.003	0.004	0.003
12-Feb-88	12-Feb-88	273	3.676	2.552	3.774	0.005	0.007	0.007	0.006
13-May-88	14-May-88	364	3.672	2.542	3.769	0.004	0.004	0.005	0.004
11-Nov-88	12-Nov-88	546	3.701	2.575	3.795	0.012	0.013	0.012	0.013
12-May-89	14-May-89	728	3.689	2.562	3.786	0.009	0.009	0.010	0.009

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
16-May-87	16-May-87	1	2.558	3.482	3.986	0.000	0.000	0.000	0.000
22-May-87	22-May-87	7	2.560	3.483	3.987	0.001	.000	.000	.000
29-May-87	29-May-87	14	2.563	3.490	3.991	0.001	0.002	0.001	0.002
12-Jun-87	12-Jun-87	28	2.564	3.488	3.990	0.002	0.002	0.001	0.002
10-Jul-87	10-Jul-87	56	2.564	3.486	3.987	0.002	0.001	.000	0.001
07-Aug-87	07-Aug-87	84	2.569	3.495	3.994	0.003	0.004	0.002	0.003
04-Sep-87	04-Sep-87	112	2.569	3.498	3.994	0.003	0.005	0.002	0.003
30-Oct-87	30-Oct-87	168	2.561	3.486	3.980	0.001	0.001	-0.002	.000
12-Feb-88	12-Feb-88	273	2.582	3.505	4.006	0.007	0.007	0.006	0.006
13-May-88	14-May-88	364	2.581	3.509	4.001	0.007	0.008	0.004	0.006
11-Nov-88	12-Nov-88	546	2.597	3.523	4.023	0.011	0.012	0.010	0.011
12-May-89	14-May-89	728	2.585	3.514	4.012	0.008	0.009	0.007	0.008

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G7 CSA 23.2-14A

Rock Type: Gravel

Locality: Valley Road

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	19-May-87	Bin 36	0.94	23	
2A,B,C	19-May-87	Box G7-2	0.94	38	
3A,B,C	19-May-87	Bin 36	1.25	23	352.806 mm
4A,B,C	19-May-87	Box G7-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
20-May-87	20-May-87	1	3.129	3.153	2.972	0.000	0.000	0.000	0.000
26-May-87	26-May-87	7	3.125	3.150	2.972	-0.001	-0.001	0.000	-0.001
02-Jun-87	02-Jun-87	14	3.124	3.151	2.974	-0.001	-0.001	0.001	.000
16-Jun-87	16-Jun-87	28	3.134	3.158	2.979	0.001	0.001	0.002	0.002
14-Jul-87	14-Jul-87	56	3.133	3.158	2.977	0.001	0.001	0.001	0.001
11-Aug-87	11-Aug-87	84	3.127	3.147	2.966	-0.001	-0.002	-0.002	-0.001
08-Sep-87	08-Sep-87	112	3.121	3.143	2.968	-0.002	-0.003	-0.001	-0.002
03-Nov-87	03-Nov-87	168	3.140	3.164	2.991	0.003	0.003	0.005	0.004
16-Feb-88	16-Feb-88	273	3.139	3.170	2.990	0.003	0.005	0.005	0.004
17-May-88	18-May-88	364	3.142	3.166	2.988	0.004	0.004	0.005	0.004
15-Nov-88	16-Nov-88	546	3.174	3.195	3.016	0.013	0.012	0.012	0.012
05-May-89	18-May-89	717	3.158	3.180	3.000	0.008	0.008	0.008	0.008

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
20-May-87	20-May-87	1	3.198	3.268	3.161	0.000	0.000	0.000	0.000
26-May-87	26-May-87	7	3.193	3.262	3.160	-0.001	-0.002	.000	-0.001
02-Jun-87	02-Jun-87	14	3.195	3.264	3.162	-0.001	-0.001	.000	-0.001
16-Jun-87	16-Jun-87	28	3.195	3.265	3.163	-0.001	-0.001	0.001	.000
14-Jul-87	14-Jul-87	56	3.200	3.268	3.164	0.001	0.000	0.001	.000
11-Aug-87	11-Aug-87	84	3.192	3.267	3.160	-0.002	.000	.000	-0.001
08-Sep-87	08-Sep-87	112	3.191	3.260	3.159	-0.002	-0.002	-0.001	-0.002
03-Nov-87	03-Nov-87	168	3.213	3.283	3.176	0.004	0.004	0.004	0.004
16-Feb-88	16-Feb-88	273	3.208	3.280	3.179	0.003	0.003	0.005	0.004
17-May-88	18-May-88	364	3.207	3.277	3.170	0.003	0.003	0.003	0.003
15-Nov-88	16-Nov-88	546	3.243	3.313	3.206	0.013	0.013	0.013	0.013
02-May-89	18-May-89	714	3.220	3.293	3.190	0.006	0.007	0.008	0.007

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G7 CSA 23.2-14A

Rock Type: Gravel

Locality: Valley Road

Dates Cast:			Alk %	Temp C
1A,B,C	19-May-87	Bin 36	0.94	23
2A,B,C	19-May-87	Box G7-2	0.94	38
3A,B,C	19-May-87	Bin 36	1.25	23
4A,B,C	19-May-87	Box G7-4	1.25	38

Sample Lengths: 352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
20-May-87	20-May-87	1	2.977	2.930	3.100	0.000	0.000	0.000	0.000
26-May-87	26-May-87	7	2.986	2.938	3.109	0.003	0.002	0.003	0.002
02-Jun-87	02-Jun-87	14	2.986	2.940	3.114	0.003	0.003	0.004	0.003
16-Jun-87	16-Jun-87	28	2.991	2.946	3.118	0.004	0.005	0.005	0.005
14-Jul-87	14-Jul-87	56	2.991	2.946	3.118	0.004	0.005	0.005	0.005
11-Aug-87	11-Aug-87	84	2.981	2.937	3.112	0.001	0.002	0.003	0.002
08-Sep-87	08-Sep-87	112	2.983	2.937	3.108	0.002	0.002	0.002	0.002
03-Nov-87	03-Nov-87	168	3.003	2.957	3.132	0.007	0.008	0.009	0.008
16-Feb-88	16-Feb-88	273	3.006	2.954	3.134	0.008	0.007	0.010	0.008
17-May-88	18-May-88	364	3.001	2.949	3.126	0.007	0.005	0.007	0.007
15-Nov-88	16-Nov-88	546	3.039	2.987	3.164	0.018	0.016	0.018	0.017
05-May-89	18-May-89	717	3.022	2.970	3.146	0.013	0.011	0.013	0.012

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
20-May-87	20-May-87	1	3.575	2.991	3.195	0.000	0.000	0.000	0.000
26-May-87	26-May-87	7	3.587	3.000	3.205	0.003	0.003	0.003	0.003
02-Jun-87	02-Jun-87	14	3.591	3.003	3.208	0.005	0.003	0.004	0.004
16-Jun-87	16-Jun-87	28	3.598	3.006	3.214	0.007	0.004	0.005	0.005
14-Jul-87	14-Jul-87	56	3.595	3.004	3.212	0.006	0.004	0.005	0.005
11-Aug-87	11-Aug-87	84	3.597	3.007	3.213	0.006	0.005	0.005	0.005
08-Sep-87	08-Sep-87	112	3.589	2.998	3.205	0.004	0.002	0.003	0.003
03-Nov-87	03-Nov-87	168	3.618	3.024	3.235	0.012	0.009	0.011	0.011
16-Feb-88	16-Feb-88	273	3.619	3.034	3.241	0.012	0.012	0.013	0.013
17-May-88	18-May-88	364	3.622	3.040	3.243	0.013	0.014	0.014	0.014
15-Nov-88	16-Nov-88	546	3.649	3.065	3.269	0.021	0.021	0.021	0.021
02-May-89	18-May-89	714	3.635	3.049	3.246	0.017	0.016	0.014	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G8 CSA 23.2-14A

Rock Type: Gravel

Locality: Chitticks Old Pit

Dates Cast:			Alk %	Temp C
1A,B,C	20-May-87	Bin 37	0.94	23
2A,B,C	20-May-87	Box G8-2	0.94	38
3A,B,C	20-May-87	Bin 37	1.25	23
4A,B,C	20-May-87	Box G8-4	1.25	38

Sample Lengths:

352.806 mm

Actual Date	Optimum Date	Actual Age	Reading 1A	Reading 1B	Reading 1C	% Elong. 1A	% Elong. 1B	% Elong. 1C	% Elong. 1 MEAN
21-May-87	21-May-87	1	3.155	3.201	3.185	0.000	0.000	0.000	0.000
27-May-87	27-May-87	7	3.147	3.195	3.178	-0.002	-0.002	-0.002	-0.002
03-Jun-87	03-Jun-87	14	3.147	3.198	3.181	-0.002	-0.001	-0.001	-0.001
17-Jun-87	17-Jun-87	28	3.155	3.201	3.185	0.000	0.000	0.000	0.000
15-Jul-87	15-Jul-87	56	3.175	3.220	3.201	0.006	0.005	0.005	0.005
12-Aug-87	12-Aug-87	84	3.155	3.198	3.185	0.000	-0.001	0.000	.000
09-Sep-87	09-Sep-87	112	3.156	3.204	3.186	.000	0.001	.000	.000
04-Nov-87	04-Nov-87	168	3.173	3.216	3.199	0.005	0.004	0.004	0.004
17-Feb-88	17-Feb-88	273	3.172	3.226	3.205	0.005	0.007	0.006	0.006
18-May-88	19-May-88	364	3.162	3.211	3.195	0.002	0.003	0.003	0.003
16-Nov-88	17-Nov-88	546	3.201	3.251	3.233	0.013	0.014	0.014	0.014
05-May-89	19-May-89	716	3.181	3.233	3.213	0.007	0.009	0.008	0.008

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	Reading 2C	% Elong. 2A	% Elong. 2B	% Elong. 2C	% Elong. 2 MEAN
21-May-87	21-May-87	1	3.353	3.425	3.356	0.000	0.000	0.000	0.000
27-May-87	27-May-87	7	3.343	3.429	3.359	-0.003	0.001	0.001	.000
03-Jun-87	03-Jun-87	14	3.339	3.428	3.358	-0.004	0.001	0.001	-0.001
17-Jun-87	17-Jun-87	28	3.346	3.436	3.364	-0.002	0.003	0.002	0.001
15-Jul-87	15-Jul-87	56	3.359	3.448	3.378	0.002	0.007	0.006	0.005
12-Aug-87	12-Aug-87	84	3.347	3.433	3.365	-0.002	0.002	0.003	0.001
09-Sep-87	09-Sep-87	112	3.355	3.443	3.378	0.001	0.005	0.006	0.004
04-Nov-87	04-Nov-87	168	3.369	3.459	3.392	0.005	0.010	0.010	0.008
17-Feb-88	17-Feb-88	273	3.373	3.466	3.395	0.006	0.012	0.011	0.009
18-May-88	19-May-88	364	3.360	3.457	3.383	0.002	0.009	0.008	0.006
16-Nov-88	17-Nov-88	546	3.402	3.492	3.423	0.014	0.019	0.019	0.017
02-May-89	19-May-89	713	3.382	3.475	3.402	0.008	0.014	0.013	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - PRISM TEST RESULTS

Sample: G8 CSA 23.2-14A

Rock Type: Gravel

Locality: Chitticks Old Pit

Dates Cast:			Alk %	Temp C	Sample Lengths:
1A,B,C	20-May-87	Bin 37	0.94	23	
2A,B,C	20-May-87	Box G8-2	0.94	38	
3A,B,C	20-May-87	Bin 37	1.25	23	352.806 mm
4A,B,C	20-May-87	Box G8-4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 3A	Reading 3B	Reading 3C	% Elong. 3A	% Elong. 3B	% Elong. 3C	% Elong. 3 MEAN
21-May-87	21-May-87	1	3.073	3.141	3.249	0.000	0.000	0.000	0.000
27-May-87	27-May-87	7	3.073	3.141	3.247	0.000	0.000	-0.001	.000
03-Jun-87	03-Jun-87	14	3.072	3.141	3.247	.000	0.000	-0.001	.000
17-Jun-87	17-Jun-87	28	3.077	3.150	3.255	0.001	0.003	0.002	0.002
15-Jul-87	15-Jul-87	56	3.090	3.156	3.262	0.005	0.004	0.004	0.004
12-Aug-87	12-Aug-87	84	3.081	3.147	3.252	0.002	0.002	0.001	0.002
09-Sep-87	09-Sep-87	112	3.082	3.150	3.251	0.003	0.003	0.001	0.002
04-Nov-87	04-Nov-87	168	3.099	3.164	3.272	0.007	0.007	0.007	0.007
17-Feb-88	17-Feb-88	273	3.106	3.171	3.275	0.009	0.009	0.007	0.008
18-May-88	19-May-88	364	3.095	3.163	3.266	0.006	0.006	0.005	0.006
16-Nov-88	17-Nov-88	546	3.136	3.202	3.307	0.018	0.013	0.016	0.017
05-May-89	19-May-89	716	3.119	3.185	3.289	0.013	0.012	0.011	0.012

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	Reading 4C	% Elong. 4A	% Elong. 4B	% Elong. 4C	% Elong. 4 MEAN
21-May-87	21-May-87	1	3.008	3.308	3.107	0.000	0.000	0.000	0.000
27-May-87	27-May-87	7	3.008	3.312	3.114	0.000	0.001	0.002	0.001
03-Jun-87	03-Jun-87	14	3.007	3.307	3.107	.000	.000	0.000	.000
17-Jun-87	17-Jun-87	28	3.016	3.315	3.118	0.002	0.002	0.003	0.002
15-Jul-87	15-Jul-87	56	3.029	3.331	3.124	0.006	0.007	0.005	0.006
12-Aug-87	12-Aug-87	84	3.025	3.310	3.119	0.005	0.001	0.003	0.003
09-Sep-87	09-Sep-87	112	3.032	3.332	3.127	0.007	0.007	0.006	0.006
04-Nov-87	04-Nov-87	168	3.055	3.354	3.159	0.013	0.013	0.015	0.014
17-Feb-88	17-Feb-88	273	3.071	3.373	3.174	0.018	0.018	0.019	0.018
18-May-88	19-May-88	364	3.058	3.363	3.162	0.014	0.016	0.016	0.015
16-Nov-88	17-Nov-88	546	3.094	3.397	3.189	0.024	0.025	0.023	0.024
02-May-89	19-May-89	713	3.076	3.382	3.175	0.019	0.021	0.019	0.020

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS1 ASTM C227-87

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:			Alk %	Temp C
2A,B	27-May-87	Tube T8	0.94	38
2C,D	27-May-87	Tube T8	0.94	38
4A,B	28-May-87	Tube T9	1.25	38
4C,D	28-May-87	Tube T9	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
28-May-87	28-May-87	1	0.764	0.902	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	0.785	0.924	0.008	0.009	0.008
26-Jun-87	27-Jun-87	30	0.795	0.935	0.012	0.013	0.013
27-Jul-87	27-Jul-87	61	0.801	0.938	0.015	0.014	0.014
26-Aug-87	26-Aug-87	91	0.794	0.934	0.012	0.013	0.012
30-Sep-87	26-Sep-87	126	0.790	0.931	0.010	0.011	0.011
26-Nov-87	26-Nov-87	183	0.802	0.941	0.015	0.015	0.015
25-Feb-88	25-Feb-88	274	0.795	0.934	0.012	0.013	0.012
26-May-88	26-May-88	365	0.794	0.930	0.012	0.011	0.011
24-Nov-88	24-Nov-88	547	0.796	0.934	0.013	0.013	0.013
26-May-89	26-May-89	730	0.806	0.947	0.017	0.018	0.017

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
28-May-87	28-May-87	1	1.597	1.689	0.000	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.615	1.705	0.007	0.006	0.007	0.008
26-Jun-87	27-Jun-87	30	1.625	1.717	0.011	0.011	0.011	0.012
27-Jul-87	27-Jul-87	61	1.627	1.719	0.012	0.012	0.012	0.013
26-Aug-87	26-Aug-87	91	1.623	1.714	0.010	0.010	0.010	0.011
30-Sep-87	26-Sep-87	126	1.621	1.709	0.009	0.008	0.009	0.010
26-Nov-87	26-Nov-87	183	1.631	1.721	0.013	0.013	0.013	0.014
25-Feb-88	25-Feb-88	274	1.624	1.714	0.011	0.010	0.010	0.011
26-May-88	26-May-88	365	1.619	1.708	0.009	0.007	0.008	0.010
24-Nov-88	24-Nov-88	547	1.627	1.716	0.012	0.011	0.011	0.012
26-May-89	26-May-89	730	1.633	1.725	0.014	0.014	0.014	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS1 ASTM C227-87

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

	Dates Cast:		Alk %	Temp C
2A,B	27-May-87	Tube T8	0.94	38
2C,D	27-May-87	Tube T8	0.94	38
4A,B	28-May-87	Tube T9	1.25	38
4C,D	28-May-87	Tube T9	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
29-May-87	29-May-87	1	1.200	1.163	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.230	1.196	0.012	0.013	0.012
29-Jun-87	28-Jun-87	32	1.245	1.212	0.018	0.019	0.019
28-Jul-87	28-Jul-87	61	1.241	1.208	0.016	0.018	0.017
27-Aug-87	27-Aug-87	91	1.256	1.223	0.022	0.024	0.023
28-Sep-87	27-Sep-87	123	1.257	1.224	0.022	0.024	0.023
27-Nov-87	27-Nov-87	183	1.253	1.219	0.021	0.022	0.021
26-Feb-88	26-Feb-88	274	1.256	1.222	0.022	0.023	0.023
27-May-88	27-May-88	365	1.251	1.219	0.020	0.022	0.021
25-Nov-88	25-Nov-88	547	1.251	1.216	0.020	0.021	0.020
26-May-89	27-May-89	729	1.256	1.224	0.022	0.024	0.023

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
29-May-87	29-May-87	1	1.788	2.029	0.000	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.807	2.053	0.007	0.009	0.008	0.010
29-Jun-87	28-Jun-87	32	1.823	2.070	0.014	0.016	0.015	0.017
28-Jul-87	28-Jul-87	61	1.820	2.068	0.013	0.015	0.014	0.015
27-Aug-87	27-Aug-87	91	1.836	2.084	0.019	0.022	0.020	0.022
28-Sep-87	27-Sep-87	123	1.836	2.084	0.019	0.022	0.020	0.022
27-Nov-87	27-Nov-87	183	1.833	2.081	0.018	0.020	0.019	0.020
26-Feb-88	26-Feb-88	274	1.838	2.084	0.020	0.022	0.021	0.022
27-May-88	27-May-88	365	1.833	2.081	0.018	0.020	0.019	0.020
25-Nov-88	25-Nov-88	547	1.832	2.081	0.017	0.020	0.019	0.020
26-May-89	27-May-89	729	1.840	2.087	0.020	0.023	0.022	0.022

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS2 ASTM C227-87

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:

			Alk %	Temp C
2A,B	28-May-87	Tube T9	0.94	38
2C,D	28-May-87	Tube T10	0.94	38
4A,B	28-May-87	Tube T10	1.25	38
4C,D	28-May-87	Tube T10	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
29-May-87	29-May-87	1	2.158	2.189	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	2.171	2.205	0.005	0.006	0.006
29-Jun-87	28-Jun-87	32	2.183	2.214	0.010	0.010	0.010
28-Jul-87	28-Jul-87	61	2.173	2.205	0.006	0.006	0.006
27-Aug-87	27-Aug-87	91	2.187	2.217	0.011	0.011	0.011
28-Sep-87	27-Sep-87	123	2.188	2.217	0.012	0.011	0.011
27-Nov-87	27-Nov-87	183	2.183	2.211	0.010	0.009	0.009
26-Feb-88	26-Feb-88	274	2.185	2.216	0.011	0.011	0.011
27-May-88	27-May-88	365	2.182	2.214	0.009	0.010	0.010
25-Nov-88	25-Nov-88	547	2.187	2.215	0.011	0.010	0.011
26-May-89	27-May-89	729	2.189	2.220	0.012	0.012	0.012

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
29-May-87	29-May-87	1	1.661	1.605	0.000	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.684	1.627	0.009	0.009	0.009	0.007
29-Jun-87	28-Jun-87	32	1.694	1.636	0.013	0.012	0.013	0.011
28-Jul-87	28-Jul-87	61	1.696	1.641	0.014	0.014	0.014	0.010
27-Aug-87	27-Aug-87	91	1.697	1.641	0.014	0.014	0.014	0.013
28-Sep-87	27-Sep-87	123	1.697	1.641	0.014	0.014	0.014	0.013
27-Nov-87	27-Nov-87	183	1.696	1.639	0.014	0.013	0.014	0.011
26-Feb-88	26-Feb-88	274	1.695	1.639	0.013	0.013	0.013	0.012
27-May-88	27-May-88	365	1.691	1.633	0.012	0.011	0.011	0.011
25-Nov-88	25-Nov-88	547	1.696	1.636	0.014	0.012	0.013	0.012
26-May-89	27-May-89	729	1.696	1.639	0.014	0.013	0.014	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS2 ASTM C227-87

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:			Alk %	Temp C
2A,B	28-May-87	Tube T9	0.94	38
2C,D	28-May-87	Tube T10	0.94	38
4A,B	28-May-87	Tube T10	1.25	38
4C,D	28-May-87	Tube T10	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
29-May-87	29-May-87	1	1.421	1.368	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.445	1.389	0.009	0.008	0.009
29-Jun-87	28-Jun-87	32	1.453	1.397	0.013	0.011	0.012
28-Jul-87	28-Jul-87	61	1.459	1.403	0.015	0.014	0.014
27-Aug-87	27-Aug-87	91	1.460	1.403	0.015	0.014	0.015
28-Sep-87	27-Sep-87	123	1.463	1.407	0.017	0.015	0.016
27-Nov-87	27-Nov-87	183	1.463	1.401	0.017	0.013	0.015
26-Feb-88	26-Feb-88	274	1.460	1.402	0.015	0.013	0.014
27-May-88	27-May-88	365	1.451	1.393	0.012	0.010	0.011
25-Nov-88	25-Nov-88	547	1.460	1.405	0.015	0.015	0.015
26-May-89	27-May-89	729	1.459	1.405	0.015	0.015	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
29-May-87	29-May-87	1	1.604	1.463	0.000	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.626	1.484	0.009	0.008	0.008	0.009
29-Jun-87	28-Jun-87	32	1.635	1.496	0.012	0.013	0.013	0.012
28-Jul-87	28-Jul-87	61	1.639	1.501	0.014	0.015	0.014	0.014
27-Aug-87	27-Aug-87	91	1.640	1.500	0.014	0.015	0.014	0.014
28-Sep-87	27-Sep-87	123	1.642	1.502	0.015	0.015	0.015	0.016
27-Nov-87	27-Nov-87	183	1.639	1.499	0.014	0.014	0.014	0.014
26-Feb-88	26-Feb-88	274	1.640	1.498	0.014	0.014	0.014	0.014
27-May-88	27-May-88	365	1.632	1.493	0.011	0.012	0.011	0.011
25-Nov-88	25-Nov-88	547	1.641	1.501	0.015	0.015	0.015	0.015
26-May-89	27-May-89	729	1.644	1.499	0.016	0.014	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS3 ASTM C227-87

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Nickolas Denys

Dates Cast:			Alk %	Temp C
2A,B	28-May-87	Tube T11	0.94	38
2C,D	28-May-87	Tube T11	0.94	38
4A,B	29-May-87	Tube T12	1.25	38
4C,D	29-May-87	Tube T12	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
29-May-87	29-May-87	1	1.709	1.581	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	1.726	1.595	0.007	0.006	0.006
29-Jun-87	28-Jun-87	32	1.734	1.607	0.010	0.010	0.010
28-Jul-87	28-Jul-87	61	1.731	1.605	0.009	0.009	0.009
27-Aug-87	27-Aug-87	91	1.735	1.606	0.010	0.010	0.010
28-Sep-87	27-Sep-87	123	1.736	1.607	0.011	0.010	0.010
27-Nov-87	27-Nov-87	183	1.730	1.602	0.008	0.008	0.008
26-Feb-88	26-Feb-88	274	1.732	1.603	0.009	0.009	0.009
27-May-88	27-May-88	365	1.729	1.592	0.008	0.004	0.006
25-Nov-88	25-Nov-88	547	1.731	1.602	0.009	0.008	0.008
26-May-89	27-May-89	729	1.731	1.601	0.009	0.008	0.008

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
29-May-87	29-May-87	1	0.823	1.070	0.000	0.000	0.000	0.000
11-Jun-87	11-Jun-87	14	0.837	1.084	0.006	0.006	0.006	0.006
29-Jun-87	28-Jun-87	32	0.847	1.092	0.009	0.009	0.009	0.010
28-Jul-87	28-Jul-87	61	0.844	1.091	0.008	0.008	0.008	0.009
27-Aug-87	27-Aug-87	91	0.848	1.093	0.010	0.009	0.009	0.010
28-Sep-87	27-Sep-87	123	0.849	1.094	0.010	0.009	0.010	0.010
27-Nov-87	27-Nov-87	183	0.845	1.090	0.009	0.008	0.008	0.008
26-Feb-88	26-Feb-88	274	0.846	1.090	0.009	0.008	0.008	0.009
27-May-88	27-May-88	365	0.818	1.082	-0.002	0.005	0.001	0.004
25-Nov-88	25-Nov-88	547	0.845	1.087	0.009	0.007	0.008	0.008
26-May-89	27-May-89	729	0.845	1.087	0.009	0.007	0.008	0.008

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	RS3	ASTM C227-87
Rock Type:	Slate, Meta-argillite (Siltstone)	
Locality:	Nickolas Denys	

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	28-May-87	Tube T11	0.94	38	
2C,D	28-May-87	Tube T11	0.94	38	
4A,B	29-May-87	Tube T12	1.25	38	254.0 mm
4C,D	29-May-87	Tube T12	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
30-May-87	30-May-87	1	1.922	1.824	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	1.936	1.835	0.006	0.004	0.005
29-Jun-87	29-Jun-87	31	1.950	1.851	0.011	0.011	0.011
29-Jul-87	29-Jul-87	61	1.947	1.847	0.010	0.009	0.009
28-Aug-87	28-Aug-87	91	1.953	1.855	0.012	0.012	0.012
28-Sep-87	28-Sep-87	122	1.955	1.856	0.013	0.013	0.013
27-Nov-87	28-Nov-87	182	1.951	1.852	0.011	0.011	0.011
26-Feb-88	27-Feb-88	273	1.951	1.853	0.011	0.011	0.011
27-May-88	28-May-88	364	1.941	1.844	0.007	0.008	0.008
25-Nov-88	26-Nov-88	546	1.949	1.851	0.011	0.011	0.011
29-May-89	28-May-89	731	1.950	1.853	0.011	0.011	0.011

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
30-May-87	30-May-87	1	1.264	1.213	0.000	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	1.278	1.227	0.006	0.006	0.006	0.005
29-Jun-87	29-Jun-87	31	1.288	1.243	0.009	0.012	0.011	0.011
29-Jul-87	29-Jul-87	61	1.285	1.236	0.008	0.009	0.009	0.009
28-Aug-87	28-Aug-87	91	1.290	1.247	0.010	0.013	0.012	0.012
28-Sep-87	28-Sep-87	122	1.291	1.249	0.011	0.014	0.012	0.013
27-Nov-87	28-Nov-87	182	1.290	1.246	0.010	0.013	0.012	0.011
26-Feb-88	27-Feb-88	273	1.288	1.247	0.009	0.013	0.011	0.011
27-May-88	28-May-88	364	1.282	1.239	0.007	0.010	0.009	0.008
25-Nov-88	26-Nov-88	546	1.288	1.243	0.009	0.012	0.011	0.011
29-May-89	28-May-89	731	1.288	1.245	0.009	0.013	0.011	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS4 ASTM C227-87

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

	Dates Cast:		Alk %	Temp C
2A,B	29-May-87	Tube T12	0.94	38
2C,D	29-May-87	Tube T13	0.94	38
4A,B	29-May-87	Tube T13	1.25	38
4C,D	29-May-87	Tube T13	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
30-May-87	30-May-87	1	1.380	1.327	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	1.395	1.347	0.006	0.008	0.007
29-Jun-87	29-Jun-87	31	1.412	1.361	0.013	0.013	0.013
29-Jul-87	29-Jul-87	61	1.412	1.362	0.013	0.014	0.013
28-Aug-87	28-Aug-87	91	1.417	1.366	0.015	0.015	0.015
28-Sep-87	28-Sep-87	122	1.417	1.367	0.015	0.016	0.015
27-Nov-87	28-Nov-87	182	1.412	1.362	0.013	0.014	0.013
26-Feb-88	27-Feb-88	273	1.411	1.360	0.012	0.013	0.013
27-May-88	28-May-88	364	1.412	1.360	0.013	0.013	0.013
25-Nov-88	26-Nov-88	546	1.413	1.361	0.013	0.013	0.013
29-May-89	28-May-89	731	1.414	1.362	0.013	0.014	0.014

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
30-May-87	30-May-87	1	1.755	1.718	0.000	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	1.774	1.737	0.007	0.007	0.007	0.007
29-Jun-87	29-Jun-87	31	1.789	1.751	0.013	0.013	0.013	0.013
29-Jul-87	29-Jul-87	61	1.790	1.753	0.014	0.014	0.014	0.013
28-Aug-87	28-Aug-87	91	1.794	1.759	0.015	0.016	0.016	0.015
28-Sep-87	28-Sep-87	122	1.796	1.761	0.016	0.017	0.017	0.016
27-Nov-87	28-Nov-87	182	1.791	1.753	0.014	0.014	0.014	0.014
26-Feb-88	27-Feb-88	273	1.787	1.753	0.013	0.014	0.013	0.013
27-May-88	28-May-88	364	1.785	1.746	0.012	0.011	0.011	0.012
25-Nov-88	26-Nov-88	546	1.791	1.755	0.014	0.015	0.014	0.014
29-May-89	28-May-89	731	1.791	1.754	0.014	0.014	0.014	0.014

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS4 ASTM C227-87

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

Dates Cast:

			Alk %	Temp C	Sample Lengths:
2A,B	29-May-87	Tube T12	0.94	38	
2C,D	29-May-87	Tube T13	0.94	38	
4A,B	29-May-87	Tube T13	1.25	38	254.0 mm
4C,D	29-May-87	Tube T13	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
30-May-87	30-May-87	1	2.000	1.848	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	2.005	1.851	0.002	0.001	0.002
29-Jun-87	29-Jun-87	31	2.018	1.865	0.007	0.007	0.007
29-Jul-87	29-Jul-87	61	2.014	1.860	0.006	0.005	0.005
28-Aug-87	28-Aug-87	91	2.020	1.868	0.008	0.008	0.008
28-Sep-87	28-Sep-87	122	2.022	1.870	0.009	0.009	0.009
27-Nov-87	28-Nov-87	182	2.018	1.865	0.007	0.007	0.007
26-Feb-88	27-Feb-88	273	2.020	1.867	0.008	0.007	0.008
27-May-88	28-May-88	364	2.013	1.858	0.005	0.004	0.005
25-Nov-88	26-Nov-88	546	2.022	1.868	0.009	0.008	0.008
29-May-89	28-May-89	731	2.022	1.870	0.009	0.009	0.009

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
30-May-87	30-May-87	1	2.133	2.138	0.000	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	2.141	2.148	0.003	0.004	0.004	0.003
29-Jun-87	29-Jun-87	31	2.154	2.161	0.008	0.009	0.009	0.008
29-Jul-87	29-Jul-87	61	2.151	2.153	0.007	0.006	0.006	0.006
28-Aug-87	28-Aug-87	91	2.155	2.163	0.009	0.010	0.009	0.009
28-Sep-87	28-Sep-87	122	2.155	2.164	0.009	0.010	0.009	0.009
27-Nov-87	28-Nov-87	182	2.151	2.160	0.007	0.009	0.008	0.007
26-Feb-88	27-Feb-88	273	2.151	2.161	0.007	0.009	0.008	0.008
27-May-88	28-May-88	364	2.146	2.159	0.005	0.008	0.007	0.006
25-Nov-88	26-Nov-88	546	2.153	2.162	0.008	0.009	0.009	0.008
29-May-89	28-May-89	731	2.153	2.161	0.008	0.009	0.008	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS5 ASTM C227-87

Rock Type: Schist

Locality: Saint John

Dates Cast:

			Alk %	Temp C
2A,B	29-May-87	Tube T14	0.94	38
2C,D	29-May-87	Tube T14	0.94	38
4A,B	01-Jun-87	Tube T15	1.25	38
4C,D	01-Jun-87	Tube T15	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
30-May-87	30-May-87	1	1.756	1.611	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	1.779	1.628	0.009	0.007	0.008
29-Jun-87	29-Jun-87	31	1.786	1.642	0.012	0.012	0.012
29-Jul-87	29-Jul-87	61	1.781	1.642	0.010	0.012	0.011
28-Aug-87	28-Aug-87	91	1.790	1.645	0.013	0.013	0.013
28-Sep-87	28-Sep-87	122	1.789	1.653	0.013	0.017	0.015
27-Nov-87	28-Nov-87	182	1.786	1.641	0.012	0.012	0.012
26-Feb-88	27-Feb-88	273	1.785	1.642	0.011	0.012	0.012
27-May-88	28-May-88	364	1.779	1.636	0.009	0.010	0.009
25-Nov-88	26-Nov-88	546	1.785	1.640	0.011	0.011	0.011
29-May-89	28-May-89	731	1.788	1.645	0.013	0.013	0.013

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
30-May-87	30-May-87	1	0.866	1.094	0.000	0.000	0.000	0.000
12-Jun-87	12-Jun-87	14	0.890	1.113	0.009	0.007	0.008	0.008
29-Jun-87	29-Jun-87	31	0.898	1.128	0.013	0.013	0.013	0.012
29-Jul-87	29-Jul-87	61	0.896	1.125	0.012	0.012	0.012	0.012
28-Aug-87	28-Aug-87	91	0.901	1.130	0.014	0.014	0.014	0.014
28-Sep-87	28-Sep-87	122	0.901	1.131	0.014	0.015	0.014	0.014
27-Nov-87	28-Nov-87	182	0.896	1.127	0.012	0.013	0.012	0.012
26-Feb-88	27-Feb-88	273	0.898	1.126	0.013	0.013	0.013	0.012
27-May-88	28-May-88	364	0.891	1.120	0.010	0.010	0.010	0.010
25-Nov-88	26-Nov-88	546	0.897	1.127	0.012	0.013	0.013	0.012
29-May-89	28-May-89	731	0.899	1.129	0.013	0.014	0.013	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	RS5	ASTM C227-87
Rock Type:	Schist	
Locality:	Saint John	

Dates Cast:

			Alk %	Temp C
2A,B	29-May-87	Tube T14	0.94	38
2C,D	29-May-87	Tube T14	0.94	38
4A,B	01-Jun-87	Tube T15	1.25	38
4C,D	01-Jun-87	Tube T15	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
02-Jun-87	02-Jun-87	1	1.937	1.553	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.963	1.611	0.010	0.023	0.017
02-Jul-87	02-Jul-87	31	1.972	1.620	0.014	0.026	0.020
31-Jul-87	01-Aug-87	60	1.973	1.621	0.014	0.027	0.020
31-Aug-87	31-Aug-87	91	1.977	1.627	0.016	0.029	0.022
01-Oct-87	01-Oct-87	122	1.978	1.626	0.016	0.029	0.022
01-Dec-87	01-Dec-87	183	1.972	1.620	0.014	0.026	0.020
01-Mar-88	01-Mar-88	274	1.972	1.620	0.014	0.026	0.020
31-May-88	31-May-88	365	1.969	1.619	0.013	0.026	0.019
29-Nov-88	29-Nov-88	547	1.975	1.625	0.015	0.028	0.022
31-May-89	31-May-89	730	1.974	1.622	0.015	0.027	0.021

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
02-Jun-87	02-Jun-87	1	1.190	1.318	0.000	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.218	1.339	0.011	0.008	0.010	0.013
02-Jul-87	02-Jul-87	31	1.226	1.348	0.014	0.012	0.013	0.017
31-Jul-87	01-Aug-87	60	1.226	1.349	0.014	0.012	0.013	0.017
31-Aug-87	31-Aug-87	91	1.234	1.354	0.017	0.014	0.016	0.019
01-Oct-87	01-Oct-87	122	1.233	1.353	0.017	0.014	0.015	0.019
01-Dec-87	01-Dec-87	183	1.230	1.350	0.016	0.013	0.014	0.017
01-Mar-88	01-Mar-88	274	1.226	1.348	0.014	0.012	0.013	0.017
31-May-88	31-May-88	365	1.227	1.355	0.015	0.015	0.015	0.017
29-Nov-88	29-Nov-88	547	1.231	1.357	0.016	0.015	0.016	0.019
31-May-89	31-May-89	730	1.228	1.351	0.015	0.013	0.014	0.017

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS6 ASTM C227-87

Rock Type: Schist

Locality: HWY 630 Heath Steele

Dates Cast:

			Alk %	Temp C
2A,B	01-Jun-87	Tube T15	0.94	38
2C,D	01-Jun-87	Tube T16	0.94	38
4A,B	01-Jun-87	Tube T16	1.25	38
4C,D	01-Jun-87	Tube T16	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
02-Jun-87	02-Jun-87	1	1.480	1.611	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.495	1.632	0.006	0.008	0.007
02-Jul-87	02-Jul-87	31	1.530	1.640	0.020	0.011	0.016
31-Jul-87	01-Aug-87	60	1.503	1.640	0.009	0.011	0.010
31-Aug-87	31-Aug-87	91	1.504	1.641	0.009	0.012	0.011
01-Oct-87	01-Oct-87	122	1.504	1.642	0.009	0.012	0.011
01-Dec-87	01-Dec-87	183	1.499	1.636	0.007	0.010	0.009
01-Mar-88	01-Mar-88	274	1.497	1.635	0.007	0.009	0.008
31-May-88	31-May-88	365	1.499	1.637	0.007	0.010	0.009
29-Nov-88	29-Nov-88	547	1.503	1.633	0.009	0.009	0.009
31-May-89	31-May-89	730	1.502	1.636	0.009	0.010	0.009

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
02-Jun-87	02-Jun-87	1	1.131	0.967	0.000	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.155	0.994	0.009	0.011	0.010	0.009
02-Jul-87	02-Jul-87	31	1.164	1.002	0.013	0.014	0.013	0.014
31-Jul-87	01-Aug-87	60	1.163	1.002	0.013	0.014	0.013	0.012
31-Aug-87	31-Aug-87	91	1.164	1.003	0.013	0.014	0.014	0.012
01-Oct-87	01-Oct-87	122	1.151	0.989	0.008	0.009	0.008	0.010
01-Dec-87	01-Dec-87	183	1.159	0.996	0.011	0.011	0.011	0.010
01-Mar-88	01-Mar-88	274	1.157	0.995	0.010	0.011	0.011	0.009
31-May-88	31-May-88	365	1.159	0.996	0.011	0.011	0.011	0.010
29-Nov-88	29-Nov-88	547	1.163	0.999	0.013	0.013	0.013	0.011
31-May-89	31-May-89	730	1.165	1.002	0.013	0.014	0.014	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS6 ASTM C227-87

Rock Type: Schist

Locality: HWY 630 Heath Steele

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	01-Jun-87	Tube T15	0.94	38	
2C,D	01-Jun-87	Tube T16	0.94	38	
4A,B	01-Jun-87	Tube T16	1.25	38	254.0 mm
4C,D	01-Jun-87	Tube T16	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
02-Jun-87	02-Jun-87	1	1.717	1.826	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.745	1.871	0.011	0.018	0.014
02-Jul-87	02-Jul-87	31	1.752	1.884	0.014	0.023	0.018
31-Jul-87	01-Aug-87	60	1.754	1.884	0.015	0.023	0.019
31-Aug-87	31-Aug-87	91	1.755	1.885	0.015	0.023	0.019
01-Oct-87	01-Oct-87	122	1.740	1.870	0.009	0.017	0.013
01-Dec-87	01-Dec-87	183	1.749	1.881	0.013	0.022	0.017
01-Mar-88	01-Mar-88	274	1.748	1.879	0.012	0.021	0.017
31-May-88	31-May-88	365	1.746	1.879	0.011	0.021	0.016
29-Nov-88	29-Nov-88	547	1.749	1.886	0.013	0.024	0.018
31-May-89	31-May-89	730	1.753	1.985	0.014	0.023	0.019

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
02-Jun-87	02-Jun-87	1	1.829	1.900	0.000	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	1.874	1.940	0.018	0.016	0.017	0.016
02-Jul-87	02-Jul-87	31	1.885	1.949	0.022	0.019	0.021	0.019
31-Jul-87	01-Aug-87	60	1.883	1.948	0.021	0.019	0.020	0.019
31-Aug-87	31-Aug-87	91	1.887	1.952	0.023	0.020	0.022	0.020
01-Oct-87	01-Oct-87	122	1.869	1.934	0.016	0.013	0.015	0.014
01-Dec-87	01-Dec-87	183	1.880	1.945	0.020	0.018	0.019	0.018
01-Mar-88	01-Mar-88	274	1.879	1.943	0.020	0.017	0.018	0.017
31-May-88	31-May-88	365	1.882	1.946	0.021	0.018	0.019	0.018
29-Nov-88	29-Nov-88	547	1.884	1.949	0.022	0.019	0.020	0.019
31-May-89	31-May-89	730	1.886	1.948	0.022	0.019	0.021	0.020

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS7 ASTM C227-87

Rock Type: Meta-greywacke

Locality: Portage-du-Lac

Dates Cast:

			Alk %	Temp c
2A,B	02-Jun-87	Tube T19	0.94	38
2C,D	01-Jun-87	Tube T17	0.94	38
4A,B	01-Jun-87	Tube T17	1.25	38
4C,D	02-Jun-87	Tube T18	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
03-Jun-87	03-Jun-87	1	1.258	1.342	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	1.296	1.375	0.015	0.013	0.014
03-Jul-87	03-Jul-87	31	1.302	1.383	0.017	0.016	0.017
03-Aug-87	02-Aug-87	62	1.311	1.394	0.021	0.020	0.021
01-Sep-87	01-Sep-87	91	1.314	1.397	0.022	0.022	0.022
02-Oct-87	02-Oct-87	122	1.311	1.395	0.021	0.021	0.021
02-Dec-87	02-Dec-87	183	1.307	1.390	0.019	0.019	0.019
02-Mar-88	02-Mar-88	274	1.305	1.389	0.019	0.019	0.019
01-Jun-88	01-Jun-88	365	1.304	1.383	0.018	0.016	0.017
30-Nov-88	30-Nov-88	547	1.308	1.388	0.020	0.018	0.019
01-Jun-89	01-Jun-89	730	1.309	1.392	0.020	0.020	0.020

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
02-Jun-87	02-Jun-87	1	2.273	2.304	0.000	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	2.293	2.324	0.008	0.008	0.008	0.011
02-Jul-87	02-Jul-87	31	2.299	2.331	0.010	0.011	0.010	0.014
31-Jul-87	01-Aug-87	60	2.298	2.331	0.010	0.011	0.010	0.015
31-Aug-87	31-Aug-87	91	2.301	2.334	0.011	0.012	0.011	0.017
01-Oct-87	01-Oct-87	122	2.299	2.337	0.010	0.013	0.012	0.016
01-Dec-87	01-Dec-87	183	2.291	2.328	0.007	0.009	0.008	0.014
01-Mar-88	01-Mar-88	274	2.291	2.326	0.007	0.009	0.008	0.013
31-May-88	31-May-88	365	2.295	2.325	0.009	0.008	0.008	0.013
29-Nov-88	29-Nov-88	547	2.296	2.331	0.009	0.011	0.010	0.014
31-May-89	31-May-89	730	2.302	2.335	0.011	0.012	0.012	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS7 ASTM C227-87

Rock Type: Meta-greywacke

Locality: Portage-du-Lac

	Dates Cast:		Alk %	Temp c
2A,B	02-Jun-87	Tube T19	0.94	38
2C,D	01-Jun-87	Tube T17	0.94	38
4A,B	01-Jun-87	Tube T17	1.25	38
4C,D	02-Jun-87	Tube T18	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
02-Jun-87	02-Jun-87	1	2.120	2.090	0.000	0.000	0.000
15-Jun-87	15-Jun-87	14	2.148	2.114	0.011	0.009	0.010
02-Jul-87	02-Jul-87	31	2.157	2.126	0.015	0.014	0.014
31-Jul-87	01-Aug-87	60	2.162	2.133	0.017	0.017	0.017
31-Aug-87	31-Aug-87	91	2.167	2.139	0.019	0.019	0.019
01-Oct-87	01-Oct-87	122	2.164	2.138	0.017	0.019	0.018
01-Dec-87	01-Dec-87	183	2.155	2.130	0.014	0.016	0.015
01-Mar-88	01-Mar-88	274	2.155	2.130	0.014	0.016	0.015
31-May-88	31-May-88	365	2.158	2.133	0.015	0.017	0.016
29-Nov-88	29-Nov-88	547	2.163	2.135	0.017	0.018	0.017
31-May-89	31-May-89	730	2.167	2.139	0.019	0.019	0.019

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
03-Jun-87	03-Jun-87	1	0.921	0.735	0.000	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	0.943	0.764	0.009	0.011	0.010	0.010
03-Jul-87	03-Jul-87	31	0.952	0.774	0.012	0.015	0.014	0.014
03-Aug-87	02-Aug-87	62	0.969	0.788	0.019	0.021	0.020	0.018
01-Sep-87	01-Sep-87	91	0.973	0.794	0.020	0.023	0.022	0.020
02-Oct-87	02-Oct-87	122	0.972	0.791	0.020	0.022	0.021	0.020
02-Dec-87	02-Dec-87	183	0.967	0.787	0.018	0.020	0.019	0.017
02-Mar-88	02-Mar-88	274	0.964	0.786	0.017	0.020	0.019	0.017
01-Jun-88	01-Jun-88	365	0.958	0.783	0.015	0.019	0.017	0.016
30-Nov-88	30-Nov-88	547	0.964	0.785	0.017	0.020	0.018	0.018
01-Jun-89	01-Jun-89	730	0.969	0.793	0.019	0.023	0.021	0.020

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS8 ASTM C227-87

Rock Type: Greywacke

Locality: Springhill (Wacke)

Dates Cast:			Alk %	Temp c
2A,B	02-Jun-87	Tube T18	0.94	38
2C,D	02-Jun-87	Tube T18	0.94	38
4A,B	02-Jun-87	Tube T19	1.25	38
4C,D	03-Jun-87	Tube T22	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
03-Jun-87	03-Jun-87	1	1.163	1.369	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	1.179	1.386	0.006	0.007	0.006
03-Jul-87	03-Jul-87	31	1.186	1.389	0.009	0.008	0.008
03-Aug-87	02-Aug-87	62	1.190	1.395	0.011	0.010	0.010
01-Sep-87	01-Sep-87	91	1.191	1.400	0.011	0.012	0.012
02-Oct-87	02-Oct-87	122	1.190	1.395	0.011	0.010	0.010
02-Dec-87	02-Dec-87	183	1.185	1.391	0.009	0.009	0.009
02-Mar-88	02-Mar-88	274	1.186	1.391	0.009	0.009	0.009
01-Jun-88	01-Jun-88	365	1.180	1.382	0.007	0.005	0.006
30-Nov-88	30-Nov-88	547	1.183	1.389	0.008	0.008	0.008
01-Jun-89	01-Jun-89	730	1.189	1.394	0.010	0.010	0.010

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
03-Jun-87	03-Jun-87	1	1.707	1.736	0.000	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	1.722	1.759	0.006	0.009	0.007	0.007
03-Jul-87	03-Jul-87	31	1.727	1.762	0.008	0.010	0.009	0.009
03-Aug-87	02-Aug-87	62	1.732	1.768	0.010	0.013	0.011	0.011
01-Sep-87	01-Sep-87	91	1.734	1.769	0.011	0.013	0.012	0.012
02-Oct-87	02-Oct-87	122	1.733	1.768	0.010	0.013	0.011	0.011
02-Dec-87	02-Dec-87	183	1.728	1.769	0.008	0.013	0.011	0.010
02-Mar-88	02-Mar-88	274	1.726	1.762	0.007	0.010	0.009	0.009
01-Jun-88	01-Jun-88	365	1.718	1.754	0.004	0.007	0.006	0.006
30-Nov-88	30-Nov-88	547	1.728	1.764	0.008	0.011	0.010	0.009
01-Jun-89	01-Jun-89	730	1.733	1.767	0.010	0.012	0.011	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS8 ASTM C227-87

Rock Type: Greywacke

Locality: Springhill (Wacke)

Dates Cast:			Alk %	Temp c	Sample Lengths:
2A,B	02-Jun-87	Tube T18	0.94	38	
2C,D	02-Jun-87	Tube T18	0.94	38	
4A,B	02-Jun-87	Tube T19	1.25	38	254.0 mm
4C,D	03-Jun-87	Tube T22	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
03-Jun-87	03-Jun-87	1	1.837	1.639	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	1.857	1.669	0.008	0.012	0.010
03-Jul-87	03-Jul-87	31	1.861	1.673	0.009	0.013	0.011
03-Aug-87	02-Aug-87	62	1.871	1.685	0.013	0.018	0.016
01-Sep-87	01-Sep-87	91	1.876	1.638	0.015	0.019	0.017
02-Oct-87	02-Oct-87	122	1.872	1.684	0.014	0.018	0.016
02-Dec-87	02-Dec-87	183	1.867	1.679	0.012	0.016	0.014
02-Mar-88	02-Mar-88	274	1.867	1.680	0.012	0.016	0.014
01-Jun-88	01-Jun-88	365	1.861	1.677	0.009	0.015	0.012
30-Nov-88	30-Nov-88	547	1.862	1.682	0.010	0.017	0.013
01-Jun-89	01-Jun-89	730	1.870	1.683	0.013	0.017	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
04-Jun-87	04-Jun-87	1	1.381	1.288	0.000	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	1.407	1.309	0.010	0.008	0.009	0.010
03-Jul-87	04-Jul-87	30	1.416	1.322	0.014	0.013	0.014	0.013
03-Aug-87	03-Aug-87	61	1.424	1.328	0.017	0.016	0.016	0.016
02-Sep-87	02-Sep-87	91	1.427	1.332	0.018	0.017	0.018	0.018
02-Oct-87	03-Oct-87	121	1.428	1.332	0.019	0.017	0.018	0.017
03-Dec-87	03-Dec-87	183	1.424	1.328	0.017	0.016	0.016	0.015
03-Mar-88	03-Mar-88	274	1.421	1.325	0.016	0.015	0.015	0.015
02-Jun-88	02-Jun-88	365	1.424	1.329	0.017	0.016	0.017	0.014
01-Dec-88	01-Dec-88	547	1.423	1.326	0.017	0.015	0.016	0.015
02-Jun-89	02-Jun-89	730	1.427	1.331	0.018	0.017	0.018	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS9 ASTM C227-87

Rock Type: Greywacke

Locality: Nigadoo River

	Dates Cast:		Alk %	Temp C
2A,B	02-Jun-87	Tube T19	0.94	38
2C,D	02-Jun-87	Tube T20	0.94	38
4A,B	02-Jun-87	Tube T20	1.25	38
4C,D	03-Jun-87	Tube T21	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
03-Jun-87	03-Jun-87	1	1.686	1.600	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	1.700	1.622	0.006	0.009	0.007
03-Jul-87	03-Jul-87	31	1.707	1.626	0.008	0.010	0.009
03-Aug-87	02-Aug-87	62	1.711	1.632	0.010	0.013	0.011
01-Sep-87	01-Sep-87	91	1.713	1.633	0.011	0.013	0.012
02-Oct-87	02-Oct-87	122	1.710	1.632	0.009	0.013	0.011
02-Dec-87	02-Dec-87	183	1.707	1.625	0.008	0.010	0.009
02-Mar-88	02-Mar-88	274	1.705	1.625	0.007	0.010	0.009
01-Jun-88	01-Jun-88	365	1.701	1.620	0.006	0.008	0.007
30-Nov-88	30-Nov-88	547	1.709	1.629	0.009	0.011	0.010
01-Jun-89	01-Jun-89	730	1.710	1.634	0.009	0.013	0.011

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
03-Jun-87	03-Jun-87	1	2.408	2.260	0.000	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	2.426	2.278	0.007	0.007	0.007	0.007
03-Jul-87	03-Jul-87	31	2.430	2.284	0.009	0.009	0.009	0.009
03-Aug-87	02-Aug-87	62	2.436	2.288	0.011	0.011	0.011	0.011
01-Sep-87	01-Sep-87	91	2.437	2.289	0.011	0.011	0.011	0.012
02-Oct-87	02-Oct-87	122	2.434	2.286	0.010	0.010	0.010	0.011
02-Dec-87	02-Dec-87	183	2.432	2.282	0.009	0.009	0.009	0.009
02-Mar-88	02-Mar-88	274	2.432	2.281	0.009	0.008	0.009	0.009
01-Jun-88	01-Jun-88	365	2.431	2.284	0.009	0.009	0.009	0.008
30-Nov-88	30-Nov-88	547	2.435	2.285	0.011	0.010	0.010	0.010
01-Jun-89	01-Jun-89	730	2.437	2.289	0.011	0.011	0.011	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS9 ASTM C227-87

Rock Type: Greywacke

Locality: Nigadoo River

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	02-Jun-87	Tube T19	0.94	38	
2C,D	02-Jun-87	Tube T20	0.94	38	
4A,B	02-Jun-87	Tube T20	1.25	38	254.0 mm
4C,D	03-Jun-87	Tube T21	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
03-Jun-87	03-Jun-87	1	2.254	2.116	0.000	0.000	0.000
16-Jun-87	16-Jun-87	14	2.283	2.157	0.011	0.016	0.014
03-Jul-87	03-Jul-87	31	2.289	2.160	0.014	0.017	0.016
03-Aug-87	02-Aug-87	62	2.294	2.165	0.016	0.019	0.018
01-Sep-87	01-Sep-87	91	2.296	2.167	0.017	0.020	0.018
02-Oct-87	02-Oct-87	122	2.293	2.165	0.015	0.019	0.017
02-Dec-87	02-Dec-87	183	2.290	2.162	0.014	0.018	0.016
02-Mar-88	02-Mar-88	274	2.289	2.161	0.014	0.018	0.016
01-Jun-88	01-Jun-88	365	2.289	2.160	0.014	0.017	0.016
30-Nov-88	30-Nov-88	547	2.293	2.162	0.015	0.018	0.017
01-Jun-89	01-Jun-89	730	2.296	2.167	0.017	0.020	0.018

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
04-Jun-87	04-Jun-87	1	0.828	0.728	0.000	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	0.842	0.756	0.006	0.011	0.008	0.011
03-Jul-87	04-Jul-87	30	0.854	0.759	0.010	0.012	0.011	0.013
03-Aug-87	03-Aug-87	61	0.857	0.761	0.011	0.013	0.012	0.015
02-Sep-87	02-Sep-87	91	0.861	0.763	0.013	0.014	0.013	0.016
02-Oct-87	03-Oct-87	121	0.859	0.765	0.012	0.015	0.013	0.015
03-Dec-87	03-Dec-87	183	0.856	0.763	0.011	0.014	0.012	0.014
03-Mar-88	03-Mar-88	274	0.851	0.758	0.009	0.012	0.010	0.013
02-Jun-88	02-Jun-88	365	0.861	0.762	0.013	0.013	0.013	0.014
01-Dec-88	01-Dec-88	547	0.855	0.760	0.011	0.013	0.012	0.014
02-Jun-89	02-Jun-89	730	0.861	0.763	0.013	0.014	0.013	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS10 ASTM C227-87

Rock Type: Quartzite

Locality: Mullin Lake Rd

Dates Cast:

			Alk %	Temp C
2A,B	04-Jun-87	Tube T24	0.94	38
2C,D	03-Jun-87	Tube T21	0.94	38
4A,B	03-Jun-87	Tube T23	1.25	38
4C,D	04-Jun-87	Tube T26	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
05-Jun-87	05-Jun-87	1	1.774	1.858	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.796	1.878	0.009	0.008	0.008
06-Jul-87	05-Jul-87	32	1.807	1.883	0.013	0.010	0.011
04-Aug-87	04-Aug-87	61	1.812	1.889	0.015	0.012	0.014
03-Sep-87	03-Sep-87	91	1.814	1.891	0.016	0.013	0.014
05-Oct-87	04-Oct-87	123	1.813	1.890	0.015	0.013	0.014
04-Dec-87	04-Dec-87	183	1.810	1.886	0.014	0.011	0.013
04-Mar-88	04-Mar-88	274	1.803	1.878	0.011	0.008	0.010
06-Jun-88	03-Jun-88	368	1.808	1.881	0.013	0.009	0.011
02-Dec-88	02-Dec-88	547	1.811	1.884	0.015	0.010	0.012
02-Jun-89	03-Jun-89	729	1.817	1.894	0.017	0.014	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
04-Jun-87	04-Jun-87	1	1.183	1.276	0.000	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	1.193	1.294	0.004	0.007	0.006	0.007
03-Jul-87	04-Jul-87	30	1.210	1.302	0.011	0.010	0.010	0.011
03-Aug-87	03-Aug-87	61	1.213	1.304	0.012	0.011	0.011	0.013
02-Sep-87	02-Sep-87	91	1.214	1.305	0.012	0.011	0.012	0.013
02-Oct-87	03-Oct-87	121	1.215	1.307	0.013	0.012	0.012	0.013
03-Dec-87	03-Dec-87	183	1.211	1.303	0.011	0.011	0.011	0.012
03-Mar-88	03-Mar-88	274	1.207	1.299	0.009	0.009	0.009	0.009
02-Jun-88	02-Jun-88	365	1.214	1.306	0.012	0.012	0.012	0.012
01-Dec-88	01-Dec-88	547	1.208	1.301	0.010	0.010	0.010	0.011
02-Jun-89	02-Jun-89	730	1.213	1.304	0.012	0.011	0.011	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	RS10	ASTM C227-87
Rock Type:	Quartzite	
Locality:	Mullin Lake Rd	

Dates Cast:			Alk %	Temp C
2A,B	04-Jun-87	Tube T24	0.94	38
2C,D	03-Jun-87	Tube T21	0.94	38
4A,B	03-Jun-87	Tube T23	1.25	38
4C,D	04-Jun-87	Tube T26	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
04-Jun-87	04-Jun-87	1	1.740	1.733	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	1.762	1.757	0.009	0.009	0.009
03-Jul-87	04-Jul-87	30	1.775	1.769	0.014	0.014	0.014
03-Aug-87	03-Aug-87	61	1.776	1.774	0.014	0.016	0.015
02-Sep-87	02-Sep-87	91	1.779	1.771	0.015	0.015	0.015
02-Oct-87	03-Oct-87	121	1.779	1.773	0.015	0.016	0.016
03-Dec-87	03-Dec-87	183	1.775	1.769	0.014	0.014	0.014
03-Mar-88	03-Mar-88	274	1.772	1.766	0.013	0.013	0.013
02-Jun-88	02-Jun-88	365	1.776	1.770	0.014	0.015	0.014
01-Dec-88	01-Dec-88	547	1.777	1.771	0.015	0.015	0.015
02-Jun-89	02-Jun-89	730	1.784	1.777	0.017	0.017	0.017

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
05-Jun-87	05-Jun-87	1	2.303	2.207	0.000	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	2.329	2.233	0.010	0.010	0.010	0.010
06-Jul-87	05-Jul-87	32	2.342	2.247	0.015	0.016	0.016	0.015
04-Aug-87	04-Aug-87	61	2.342	2.247	0.015	0.016	0.016	0.015
03-Sep-87	03-Sep-87	91	2.344	2.249	0.016	0.017	0.016	0.016
05-Oct-87	04-Oct-87	123	2.341	2.248	0.015	0.016	0.016	0.016
04-Dec-87	04-Dec-87	183	2.338	2.244	0.014	0.015	0.014	0.014
04-Mar-88	04-Mar-88	274	2.336	2.241	0.013	0.013	0.013	0.013
06-Jun-88	03-Jun-88	368	2.343	2.247	0.016	0.016	0.016	0.015
02-Dec-88	02-Dec-88	547	2.342	2.245	0.015	0.015	0.015	0.015
02-Jun-89	03-Jun-89	729	2.347	2.252	0.017	0.018	0.018	0.017

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS11 ASTMC227-87

Rock Type: Quartzite

Locality: Moores Mills

Dates Cast:			Alk %	Temp C
2A,B	03-Jun-87	Tube T22	0.94	38
2C,D	03-Jun-87	Tube T22	0.94	38
4A,B	03-Jun-87	Tube T23	1.25	38
4C,D	04-Jun-87	Tube T24	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
04-Jun-87	04-Jun-87	1	2.359	2.319	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	2.368	2.326	0.004	0.003	0.003
03-Jul-87	04-Jul-87	30	2.380	2.339	0.008	0.008	0.008
03-Aug-87	03-Aug-87	61	2.383	2.341	0.009	0.009	0.009
02-Sep-87	02-Sep-87	91	2.383	2.340	0.009	0.008	0.009
02-Oct-87	03-Oct-87	121	2.382	2.340	0.009	0.008	0.009
03-Dec-87	03-Dec-87	183	2.376	2.335	0.007	0.006	0.006
03-Mar-88	03-Mar-88	274	2.374	2.332	0.006	0.005	0.006
02-Jun-88	02-Jun-88	365	2.380	2.334	0.008	0.006	0.007
01-Dec-88	01-Dec-88	547	2.382	2.338	0.009	0.007	0.008
02-Jun-89	02-Jun-89	730	2.384	2.344	0.010	0.010	0.010

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
04-Jun-87	04-Jun-87	1	1.714	1.604	0.000	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	1.721	1.610	0.003	0.002	0.003	0.003
03-Jul-87	04-Jul-87	30	1.738	1.627	0.009	0.009	0.009	0.009
03-Aug-87	03-Aug-87	61	1.739	1.629	0.010	0.010	0.010	0.009
02-Sep-87	02-Sep-87	91	1.738	1.628	0.009	0.009	0.009	0.009
02-Oct-87	03-Oct-87	121	1.738	1.627	0.009	0.009	0.009	0.009
03-Dec-87	03-Dec-87	183	1.732	1.621	0.007	0.007	0.007	0.007
03-Mar-88	03-Mar-88	274	1.731	1.622	0.007	0.007	0.007	0.006
02-Jun-88	02-Jun-88	365	1.731	1.624	0.007	0.008	0.007	0.007
01-Dec-88	01-Dec-88	547	1.734	1.624	0.008	0.008	0.008	0.008
02-Jun-89	02-Jun-89	730	1.742	1.630	0.011	0.010	0.011	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	RS11	ASTMC227-87
Rock Type:	Quartzite	
Locality:	Moores Mills	

Dates Cast:

			Alk %	Temp C	Sample Lengths:
2A,B	03-Jun-87	Tube T22	0.94	38	
2C,D	03-Jun-87	Tube T22	0.94	38	
4A,B	03-Jun-87	Tube T23	1.25	38	254.0 mm
4C,D	04-Jun-87	Tube T24	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
04-Jun-87	04-Jun-87	1	2.163	2.054	0.000	0.000	0.000
17-Jun-87	17-Jun-87	14	2.172	2.087	0.004	0.013	0.008
03-Jul-87	04-Jul-87	30	2.186	2.096	0.009	0.017	0.013
03-Aug-87	03-Aug-87	61	2.188	2.097	0.010	0.017	0.013
02-Sep-87	02-Sep-87	91	2.188	2.098	0.010	0.017	0.014
02-Oct-87	03-Oct-87	121	2.188	2.098	0.010	0.017	0.014
03-Dec-87	03-Dec-87	183	2.183	2.095	0.008	0.016	0.012
03-Mar-88	03-Mar-88	274	2.180	2.092	0.007	0.015	0.011
02-Jun-88	02-Jun-88	365	2.188	2.097	0.010	0.017	0.013
01-Dec-88	01-Dec-88	547	2.186	2.095	0.009	0.016	0.013
02-Jun-89	02-Jun-89	730	2.192	2.102	0.011	0.019	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
05-Jun-87	05-Jun-87	1	0.761	0.879	0.000	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	0.779	0.896	0.007	0.007	0.007	0.008
06-Jul-87	05-Jul-87	32	0.795	0.910	0.013	0.012	0.013	0.013
04-Aug-87	04-Aug-87	61	0.793	0.910	0.013	0.012	0.012	0.013
03-Sep-87	03-Sep-87	91	0.797	0.913	0.014	0.013	0.014	0.014
05-Oct-87	04-Oct-87	123	0.793	0.910	0.013	0.012	0.012	0.013
04-Dec-87	04-Dec-87	183	0.790	0.905	0.011	0.010	0.011	0.011
04-Mar-88	04-Mar-88	274	0.788	0.905	0.011	0.010	0.010	0.011
06-Jun-88	03-Jun-88	368	0.785	0.898	0.009	0.007	0.008	0.011
02-Dec-88	02-Dec-88	547	0.791	0.905	0.012	0.010	0.011	0.012
02-Jun-89	03-Jun-89	729	0.800	0.914	0.015	0.014	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS12 ASTM C227-87

Rock Type: Silicified Volcanic

Locality: Jacquet R.(Rhyolite)

Dates Cast:			Alk %	Temp C
2A,B	04-Jun-87	Tube T24	0.94	38
2C,D	04-Jun-87	Tube T25	0.94	38
4A,B	08-Jun-87	Tube T30	1.25	38
4C,D	04-Jun-87	Tube T26	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
05-Jun-87	05-Jun-87	1	1.243	1.167	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.245	1.170	0.001	0.001	0.001
06-Jul-87	05-Jul-87	32	1.255	1.184	0.005	0.007	0.006
04-Aug-87	04-Aug-87	61	1.255	1.186	0.005	0.007	0.006
03-Sep-87	03-Sep-87	91	1.258	1.187	0.006	0.008	0.007
05-Oct-87	04-Oct-87	123	1.257	1.185	0.006	0.007	0.006
04-Dec-87	04-Dec-87	183	1.256	1.185	0.005	0.007	0.006
04-Mar-88	04-Mar-88	274	1.256	1.184	0.005	0.007	0.006
06-Jun-88	03-Jun-88	368	1.252	1.182	0.004	0.006	0.005
02-Dec-88	02-Dec-88	547	1.261	1.187	0.007	0.008	0.007
02-Jun-89	03-Jun-89	729	1.264	1.192	0.008	0.010	0.009

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
05-Jun-87	05-Jun-87	1	1.803	1.795	0.000	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.883	1.818	0.031	0.009	0.020	0.011
06-Jul-87	05-Jul-87	32	1.893	1.827	0.035	0.013	0.024	0.015
04-Aug-87	04-Aug-87	61	1.892	1.827	0.035	0.013	0.024	0.015
03-Sep-87	03-Sep-87	91	1.896	1.836	0.037	0.016	0.026	0.017
05-Oct-87	04-Oct-87	123	1.888	1.825	0.033	0.012	0.023	0.014
04-Dec-87	04-Dec-87	183	1.892	1.828	0.035	0.013	0.024	0.015
04-Mar-88	04-Mar-88	274	1.888	1.828	0.033	0.013	0.023	0.015
06-Jun-88	03-Jun-88	368	1.893	1.830	0.035	0.014	0.025	0.015
02-Dec-88	02-Dec-88	547	1.895	1.831	0.036	0.014	0.025	0.016
02-Jun-89	03-Jun-89	729	1.901	1.838	0.039	0.017	0.028	0.018

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS12 ASTM C227-87

Rock Type: Silicified Volcanic

Locality: Jacquet R.(Rhyolite)

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	04-Jun-87	Tube T24	0.94	38	
2C,D	04-Jun-87	Tube T25	0.94	38	
4A,B	08-Jun-87	Tube T30	1.25	38	254.0 mm
4C,D	04-Jun-87	Tube T26	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
09-Jun-87	09-Jun-87	1	1.780	1.890	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	1.786	1.899	0.002	0.004	0.003
09-Jul-87	09-Jul-87	31	1.801	1.911	0.008	0.008	0.008
07-Aug-87	08-Aug-87	60	1.796	1.906	0.006	0.006	0.006
07-Sep-87	07-Sep-87	91	1.802	1.911	0.009	0.008	0.008
09-Oct-87	08-Oct-87	123	1.800	1.910	0.008	0.008	0.008
08-Dec-87	08-Dec-87	183	1.801	1.912	0.008	0.009	0.008
08-Mar-88	08-Mar-88	274	1.805	1.916	0.010	0.010	0.010
07-Jun-88	07-Jun-88	365	1.804	1.919	0.009	0.011	0.010
06-Dec-88	06-Dec-88	547	1.803	1.911	0.009	0.008	0.009
07-Jun-89	07-Jun-89	730	1.809	1.918	0.011	0.011	0.011

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
05-Jun-87	05-Jun-87	1	1.979	2.091	0.000	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.991	2.102	0.005	0.004	0.005	0.004
06-Jul-87	05-Jul-87	32	2.003	2.114	0.009	0.009	0.009	0.009
04-Aug-87	04-Aug-87	61	2.003	2.115	0.009	0.009	0.009	0.008
03-Sep-87	03-Sep-87	91	2.005	2.118	0.010	0.011	0.010	0.009
05-Oct-87	04-Oct-87	123	2.002	2.115	0.009	0.009	0.009	0.009
04-Dec-87	04-Dec-87	183	2.002	2.115	0.009	0.009	0.009	0.009
04-Mar-88	04-Mar-88	274	2.000	2.112	0.008	0.008	0.008	0.009
06-Jun-88	03-Jun-88	368	2.003	2.116	0.009	0.010	0.010	0.010
02-Dec-88	02-Dec-88	547	2.007	2.118	0.011	0.011	0.011	0.010
02-Jun-89	03-Jun-89	729	2.012	2.125	0.013	0.013	0.013	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: KS13 ASTM C227-87

Rock Type: Microphyric Rhyolite

Locality: HWY 430/Tomogomops L.

	Dates Cast:		Alk %	Temp C
2A,B	04-Jun-87	Tube T25	0.94	38
2C,D	04-Jun-87	Tube T25	0.94	38
4A,B	05-Jun-87	Tube T27	1.25	38
4C,D	05-Jun-87	Tube T27	1.25	38

Sample
Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
05-Jun-87	05-Jun-87	1	1.360	1.207	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.387	1.213	0.011	0.002	0.006
06-Jul-87	05-Jul-87	32	1.397	1.224	0.015	0.007	0.011
04-Aug-87	04-Aug-87	61	1.395	1.223	0.014	0.006	0.010
03-Sep-87	03-Sep-87	91	1.399	1.226	0.015	0.007	0.011
05-Oct-87	04-Oct-87	123	1.391	1.218	0.012	0.004	0.008
04-Dec-87	04-Dec-87	183	1.395	1.223	0.014	0.006	0.010
04-Mar-88	04-Mar-88	274	1.391	1.219	0.012	0.005	0.008
06-Jun-88	03-Jun-88	368	1.394	1.221	0.013	0.006	0.009
02-Dec-88	02-Dec-88	547	1.392	1.216	0.013	0.004	0.008
02-Jun-89	03-Jun-89	729	1.400	1.226	0.016	0.007	0.012

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
05-Jun-87	05-Jun-87	1	1.710	1.578	0.000	0.000	0.000	0.000
18-Jun-87	18-Jun-87	14	1.719	1.595	0.004	0.007	0.005	0.006
06-Jul-87	05-Jul-87	32	1.731	1.605	0.008	0.011	0.009	0.010
04-Aug-87	04-Aug-87	61	1.729	1.604	0.007	0.010	0.009	0.009
03-Sep-87	03-Sep-87	91	1.733	1.606	0.009	0.011	0.010	0.011
05-Oct-87	04-Oct-87	123	1.727	1.599	0.007	0.008	0.007	0.008
04-Dec-87	04-Dec-87	183	1.727	1.600	0.007	0.009	0.008	0.009
04-Mar-88	04-Mar-88	274	1.723	1.596	0.005	0.007	0.006	0.007
06-Jun-88	03-Jun-88	368	1.728	1.599	0.007	0.008	0.008	0.009
02-Dec-88	02-Dec-88	547	1.724	1.598	0.006	0.008	0.007	0.007
02-Jun-89	03-Jun-89	729	1.734	1.605	0.009	0.011	0.010	0.011

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS13 ASTM C227-87

Rock Type: Microphyric Rhyolite

Locality: HWY 430/Tomogomops L.

	Dates Cast:		Alk %	Temp C
2A,B	04-Jun-87	Tube T25	0.94	38
2C,D	04-Jun-87	Tube T25	0.94	38
4A,B	05-Jun-87	Tube T27	1.25	38
4C,D	05-Jun-87	Tube T27	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
06-Jun-87	06-Jun-87	1	0.957	1.045	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	0.972	1.063	0.006	0.007	0.006
06-Jul-87	06-Jul-87	31	0.981	1.074	0.009	0.011	0.010
05-Aug-87	05-Aug-87	61	0.977	1.069	0.008	0.009	0.009
04-Sep-87	04-Sep-87	91	0.979	1.071	0.009	0.010	0.009
05-Oct-87	05-Oct-87	122	0.984	1.076	0.011	0.012	0.011
04-Dec-87	05-Dec-87	182	0.980	1.077	0.009	0.013	0.011
04-Mar-88	05-Mar-88	273	0.977	1.071	0.008	0.010	0.009
06-Jun-88	04-Jun-88	367	0.978	1.068	0.008	0.009	0.009
02-Dec-88	03-Dec-88	546	0.981	1.072	0.009	0.011	0.010
05-Jun-89	04-Jun-89	731	0.986	1.077	0.011	0.013	0.012

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
06-Jun-87	06-Jun-87	1	1.733	1.866	0.000	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	1.754	1.880	0.008	0.006	0.007	0.007
06-Jul-87	06-Jul-87	31	1.766	1.890	0.013	0.009	0.011	0.011
05-Aug-87	05-Aug-87	61	1.760	1.888	0.011	0.009	0.010	0.009
04-Sep-87	04-Sep-87	91	1.762	1.888	0.011	0.009	0.010	0.010
05-Oct-87	05-Oct-87	122	1.766	1.892	0.013	0.010	0.012	0.012
04-Dec-87	05-Dec-87	182	1.768	1.888	0.014	0.009	0.011	0.011
04-Mar-88	05-Mar-88	273	1.764	1.886	0.012	0.008	0.010	0.010
04-Jun-88	04-Jun-88	365	1.762	1.884	0.011	0.007	0.009	0.009
02-Dec-88	03-Dec-88	546	1.763	1.889	0.012	0.009	0.010	0.010
05-Jun-89	04-Jun-89	731	1.770	1.894	0.015	0.011	0.013	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS14 ASTM C227-87

Rock Type: Rhyolitic Tuff

Locality: Mt. Pleasent

Dates Cast:

			Alk %	Temp C
2A,B	08-Jun-87	Tube T30	0.94	38
2C,D	05-Jun-87	Tube T27	0.94	38
4A,B	08-Jun-87	Tube T30	1.25	38
4C,D	05-Jun-87	Tube T28	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
09-Jun-87	09-Jun-87	1	1.366	1.409	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	1.365	1.406	.000	-0.001	-0.001
09-Jul-87	09-Jul-87	31	1.378	1.422	0.005	0.005	0.005
07-Aug-87	08-Aug-87	60	1.368	1.413	0.001	0.002	0.001
07-Sep-87	07-Sep-87	91	1.377	1.421	0.004	0.005	0.005
08-Oct-87	08-Oct-87	122	1.375	1.418	0.004	0.004	0.004
08-Dec-87	08-Dec-87	183	1.374	1.418	0.003	0.004	0.003
08-Mar-88	08-Mar-88	274	1.376	1.420	0.004	0.004	0.004
07-Jun-88	07-Jun-88	365	1.375	1.421	0.004	0.005	0.004
06-Dec-88	06-Dec-88	547	1.377	1.422	0.004	0.005	0.005
07-Jun-89	07-Jun-89	730	1.383	1.428	0.007	0.007	0.007

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
06-Jun-87	06-Jun-87	1	1.780	1.848	0.000	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	1.796	1.861	0.006	0.005	0.006	0.002
06-Jul-87	06-Jul-87	31	1.804	1.871	0.009	0.009	0.009	0.007
05-Aug-87	05-Aug-87	61	1.797	1.865	0.007	0.007	0.007	0.004
04-Sep-87	04-Sep-87	91	1.800	1.866	0.008	0.007	0.007	0.006
05-Oct-87	05-Oct-87	122	1.803	1.871	0.009	0.009	0.009	0.006
04-Dec-87	05-Dec-87	182	1.799	1.867	0.007	0.007	0.007	0.005
04-Mar-88	05-Mar-88	273	1.797	1.866	0.007	0.007	0.007	0.006
06-Jun-88	04-Jun-88	367	1.799	1.868	0.007	0.008	0.008	0.006
02-Dec-88	03-Dec-88	546	1.802	1.870	0.009	0.009	0.009	0.007
05-Jun-89	04-Jun-89	731	1.809	1.875	0.011	0.011	0.011	0.009

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS14 ASTM C227-87

Rock Type: Rhyolitic Tuff

Locality: Mt. Pleasent

Dates Cast:

			Alk %	Temp C
2A,B	08-Jun-87	Tube T30	0.94	38
2C,D	05-Jun-87	Tube T27	0.94	38
4A,B	08-Jun-87	Tube T30	1.25	38
4C,D	05-Jun-87	Tube T28	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
09-Jun-87	09-Jun-87	1	1.639	1.631	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	1.639	1.643	0.000	0.005	0.002
09-Jul-87	09-Jul-87	31	1.654	1.657	0.006	0.010	0.008
07-Aug-87	08-Aug-87	60	1.646	1.648	0.003	0.007	0.005
07-Sep-87	07-Sep-87	91	1.655	1.657	0.006	0.010	0.008
08-Oct-87	08-Oct-87	122	1.650	1.654	0.004	0.009	0.007
08-Dec-87	08-Dec-87	183	1.649	1.651	0.004	0.008	0.006
08-Mar-88	08-Mar-88	274	1.650	1.651	0.004	0.008	0.006
07-Jun-88	07-Jun-88	365	1.650	1.654	0.004	0.009	0.007
06-Dec-88	06-Dec-88	547	1.651	1.656	0.005	0.010	0.007
07-Jun-89	07-Jun-89	730	1.660	1.663	0.008	0.013	0.010

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
06-Jun-87	06-Jun-87	1	1.108	1.418	0.000	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	1.135	1.446	0.011	0.011	0.011	0.007
06-Jul-87	06-Jul-87	31	1.143	1.452	0.014	0.013	0.014	0.011
05-Aug-87	05-Aug-87	61	1.144	1.452	0.014	0.013	0.014	0.009
04-Sep-87	04-Sep-87	91	1.141	1.451	0.013	0.013	0.013	0.011
05-Oct-87	05-Oct-87	122	1.146	1.454	0.015	0.014	0.015	0.011
04-Dec-87	05-Dec-87	182	1.141	1.451	0.013	0.013	0.013	0.009
04-Mar-88	05-Mar-88	273	1.141	1.454	0.013	0.014	0.014	0.010
06-Jun-88	04-Jun-88	367	1.138	1.452	0.012	0.013	0.013	0.010
02-Dec-88	03-Dec-88	546	1.144	1.453	0.014	0.014	0.014	0.011
05-Jun-89	04-Jun-89	731	1.147	1.457	0.015	0.015	0.015	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS15 ASTM C227-87

Rock Type: Rhyolitic Lava

Locality: Bethel (Rhyolite)

Dates Cast:			Alk %	Temp C
2A,B	05-Jun-87	Tube T27	0.94	38
2C,D	05-Jun-87	Tube T27	0.94	39
4A,B	09-Jun-87	Tube T31	1.25	38
4C,D	08-Jun-87	Tube T29	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
06-Jun-87	06-Jun-87	1	1.691	1.568	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	1.708	1.594	0.007	0.010	0.008
06-Jul-87	06-Jul-87	31	1.715	1.600	0.009	0.013	0.011
05-Aug-87	05-Aug-87	61	1.717	1.602	0.010	0.013	0.012
04-Sep-87	04-Sep-87	91	1.716	1.599	0.010	0.012	0.011
05-Oct-87	05-Oct-87	122	1.717	1.604	0.010	0.014	0.012
04-Dec-87	05-Dec-87	182	1.714	1.602	0.009	0.013	0.011
04-Mar-88	05-Mar-88	273	1.714	1.599	0.009	0.012	0.011
06-Jun-88	04-Jun-88	367	1.714	1.600	0.009	0.013	0.011
02-Dec-88	03-Dec-88	546	1.716	1.601	0.010	0.013	0.011
05-Jun-89	04-Jun-89	731	1.720	1.606	0.011	0.015	0.013

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
06-Jun-87	06-Jun-87	1	2.507	2.412	0.000	0.000	0.000	0.000
19-Jun-87	19-Jun-87	14	2.537	2.434	0.012	0.009	0.010	0.009
06-Jul-87	06-Jul-87	31	2.543	2.440	0.014	0.011	0.013	0.012
05-Aug-87	05-Aug-87	61	2.544	2.440	0.015	0.011	0.013	0.012
04-Sep-87	04-Sep-87	91	2.539	2.435	0.013	0.009	0.011	0.011
05-Oct-87	05-Oct-87	122	2.544	2.440	0.015	0.011	0.013	0.013
04-Dec-87	05-Dec-87	182	2.540	2.436	0.013	0.009	0.011	0.011
04-Mar-88	05-Mar-88	273	2.539	2.436	0.013	0.009	0.011	0.011
06-Jun-88	04-Jun-88	367	2.541	2.435	0.013	0.009	0.011	0.011
02-Dec-88	03-Dec-88	546	2.541	2.437	0.013	0.010	0.012	0.012
04-Jun-89	04-Jun-89	730	2.545	2.442	0.015	0.012	0.013	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS15 ASTM C227-87

Rock Type: Rhyolitic Lava

Locality: Bethel (Rhyolite)

	Dates Cast:		Alk %	Temp C
2A,B	05-Jun-87	Tube T27	0.94	38
2C,D	05-Jun-87	Tube T27	0.94	38
4A,B	09-Jun-87	Tube T31	1.25	38
4C,D	08-Jun-87	Tube T29	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
10-Jun-87	10-Jun-87	1	1.819	1.618	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.832	1.633	0.005	0.006	0.006
10-Jul-87	10-Jul-87	31	1.845	1.643	0.010	0.010	0.010
10-Aug-87	09-Aug-87	62	1.845	1.640	0.010	0.009	0.009
08-Sep-87	08-Sep-87	91	1.849	1.646	0.012	0.011	0.011
09-Oct-87	09-Oct-87	122	1.848	1.643	0.011	0.010	0.011
09-Dec-87	09-Dec-87	183	1.844	1.639	0.010	0.008	0.009
09-Mar-88	09-Mar-88	274	1.848	1.641	0.011	0.009	0.010
08-Jun-88	08-Jun-88	365	1.843	1.636	0.009	0.007	0.008
07-Dec-88	07-Dec-88	547	1.846	1.640	0.011	0.009	0.010
08-Jun-89	08-Jun-89	730	1.850	1.645	0.012	0.011	0.011

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
09-Jun-87	09-Jun-87	1	2.268	2.223	0.000	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	2.277	2.241	0.004	0.007	0.005	0.005
09-Jul-87	09-Jul-87	31	2.292	2.255	0.009	0.013	0.011	0.011
07-Aug-87	08-Aug-87	60	2.279	2.242	0.004	0.007	0.006	0.008
07-Sep-87	07-Sep-87	91	2.294	2.255	0.010	0.013	0.011	0.011
08-Oct-87	08-Oct-87	122	2.293	2.257	0.010	0.013	0.012	0.011
08-Dec-87	08-Dec-87	183	2.294	2.257	0.010	0.013	0.012	0.010
08-Mar-88	08-Mar-88	274	2.292	2.253	0.009	0.012	0.011	0.010
07-Jun-88	07-Jun-88	365	2.290	2.250	0.009	0.011	0.010	0.009
06-Dec-88	06-Dec-88	547	2.289	2.253	0.008	0.012	0.010	0.010
07-Jun-89	07-Jun-89	730	2.295	2.259	0.011	0.014	0.012	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS16 ASTM C227-87

Rock Type: Silicic Lava

Locality: Digdeguash

Dates Cast:

			Alk %	Temp C
2A,B	08-Jun-87	Tube T29	0.94	38
2C,D	08-Jun-87	Tube T29	0.94	38
4A,B	08-Jun-87	Tube T30	1.25	38
4C,D	09-Jun-87	Tube T32	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
09-Jun-87	09-Jun-87	1	1.231	1.277	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	1.245	1.292	0.006	0.006	0.006
09-Jul-87	09-Jul-87	31	1.260	1.305	0.011	0.011	0.011
07-Aug-87	08-Aug-87	60	1.254	1.298	0.009	0.008	0.009
07-Sep-87	07-Sep-87	91	1.259	1.305	0.011	0.011	0.011
08-Oct-87	08-Oct-87	122	1.259	1.304	0.011	0.011	0.011
08-Dec-87	08-Dec-87	183	1.259	1.302	0.011	0.010	0.010
08-Mar-88	08-Mar-88	274	1.255	1.299	0.009	0.009	0.009
07-Jun-88	07-Jun-88	365	1.253	1.301	0.009	0.009	0.009
06-Dec-88	06-Dec-88	547	1.256	1.302	0.010	0.010	0.010
07-Jun-89	07-Jun-89	730	1.263	1.307	0.013	0.012	0.012

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
09-Jun-87	09-Jun-87	1	2.039	1.892	0.000	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	2.052	1.906	0.005	0.006	0.005	0.006
09-Jul-87	09-Jul-87	31	2.068	1.920	0.011	0.011	0.011	0.011
07-Aug-87	08-Aug-87	60	2.063	1.914	0.009	0.009	0.009	0.009
07-Sep-87	07-Sep-87	91	2.070	1.921	0.012	0.011	0.012	0.011
08-Oct-87	08-Oct-87	122	2.068	1.920	0.011	0.011	0.011	0.011
08-Dec-87	08-Dec-87	183	2.067	1.918	0.011	0.010	0.011	0.011
08-Mar-88	08-Mar-88	274	2.066	1.915	0.011	0.009	0.010	0.009
07-Jun-88	07-Jun-88	365	2.064	1.916	0.010	0.009	0.010	0.009
06-Dec-88	06-Dec-88	547	2.067	1.917	0.011	0.010	0.010	0.010
07-Jun-89	07-Jun-89	730	2.073	1.923	0.013	0.012	0.013	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: RS16 ASTM C227-87

Rock Type: Silicic Lava

Locality: Digdeguash

	Dates Cast:		Alk %	Temp C	Sample Lengths:
2A,B	08-Jun-87	Tube T29	0.94	38	
2C,D	08-Jun-87	Tube T29	0.94	38	
4A,B	08-Jun-87	Tube T30	1.25	38	254.0 mm
4C,D	09-Jun-87	Tube T32	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
09-Jun-87	09-Jun-87	1	2.356	2.430	0.000	0.000	0.000
22-Jun-87	22-Jun-87	14	2.377	2.446	0.008	0.006	0.007
09-Jul-87	09-Jul-87	31	2.390	2.464	0.013	0.013	0.013
07-Aug-87	08-Aug-87	60	2.385	2.457	0.011	0.011	0.011
07-Sep-87	07-Sep-87	91	2.392	2.462	0.014	0.013	0.013
09-Oct-87	08-Oct-87	123	2.389	2.460	0.013	0.012	0.012
08-Dec-87	08-Dec-87	183	2.394	2.458	0.015	0.011	0.013
08-Mar-88	08-Mar-88	274	2.390	2.463	0.013	0.013	0.013
07-Jun-88	07-Jun-88	365	2.391	2.462	0.014	0.013	0.013
06-Dec-88	06-Dec-88	547	2.387	2.457	0.012	0.011	0.011
07-Jun-89	07-Jun-89	730	2.396	2.468	0.016	0.015	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
10-Jun-87	10-Jun-87	1	2.494	2.343	0.000	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	2.508	2.354	0.006	0.004	0.005	0.006
10-Jul-87	10-Jul-87	31	2.518	2.365	0.009	0.009	0.009	0.011
10-Aug-87	09-Aug-87	62	2.518	2.363	0.009	0.008	0.009	0.010
08-Sep-87	08-Sep-87	91	2.521	2.367	0.011	0.009	0.010	0.012
09-Oct-87	09-Oct-87	122	2.520	2.371	0.010	0.011	0.011	0.012
09-Dec-87	09-Dec-87	183	2.521	2.364	0.011	0.008	0.009	0.011
09-Mar-88	09-Mar-88	274	2.520	2.363	0.010	0.008	0.009	0.011
08-Jun-88	08-Jun-88	365	2.520	2.364	0.010	0.008	0.009	0.011
07-Dec-88	07-Dec-88	547	2.517	2.359	0.009	0.006	0.008	0.010
08-Jun-89	08-Jun-89	730	2.526	2.366	0.013	0.009	0.011	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S1 ASTM C227-87

Type: Natural Sand

Locality: Bosse Pit

Dates Cast:			Alk %	Temp C
2A,B	10-Jun-87	Tube T34	0.94	38
2C,D	09-Jun-87	Tube T31	0.94	38
4A,B	09-Jun-87	Tube T31	1.25	38
4C,D	09-Jun-87	Tube T32	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
11-Jun-87	11-Jun-87	1	2.054	2.060	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	2.069	2.073	0.006	0.005	0.006
10-Jul-87	11-Jul-87	30	2.082	2.085	0.011	0.010	0.010
10-Aug-87	10-Aug-87	61	2.080	2.083	0.010	0.009	0.010
09-Sep-87	09-Sep-87	91	2.079	2.084	0.010	0.009	0.010
09-Oct-87	10-Oct-87	121	2.076	2.080	0.009	0.008	0.008
10-Dec-87	10-Dec-87	183	2.077	2.081	0.009	0.008	0.009
10-Mar-88	10-Mar-88	274	2.077	2.082	0.009	0.009	0.009
09-Jun-88	09-Jun-88	365	2.082	2.085	0.011	0.010	0.010
08-Dec-88	08-Dec-88	547	2.081	2.087	0.011	0.011	0.011
09-Jun-89	09-Jun-89	730	2.092	2.096	0.015	0.014	0.015

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
10-Jun-87	10-Jun-87	1	1.227	1.238	0.000	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.244	1.246	0.007	0.003	0.005	0.005
10-Jul-87	10-Jul-87	31	1.259	1.259	0.013	0.008	0.010	0.010
10-Aug-87	09-Aug-87	62	1.259	1.260	0.013	0.009	0.011	0.010
08-Sep-87	08-Sep-87	91	1.264	1.270	0.015	0.013	0.014	0.012
09-Oct-87	09-Oct-87	122	1.260	1.263	0.013	0.010	0.011	0.010
09-Dec-87	09-Dec-87	183	1.260	1.261	0.013	0.009	0.011	0.010
09-Mar-88	09-Mar-88	274	1.263	1.264	0.014	0.010	0.012	0.011
08-Jun-88	08-Jun-88	365	1.263	1.264	0.014	0.010	0.012	0.011
07-Dec-88	07-Dec-88	547	1.263	1.263	0.014	0.010	0.012	0.011
08-Jun-89	08-Jun-89	730	1.270	1.271	0.017	0.013	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S1 ASTM C227-87

Type: Natural Sand

Locality: Bosse Pit

	Dates Cast:		Alk %	Temp C	Sample Lengths:
2A,B	10-Jun-87	Tube T34	0.94	38	
2C,D	09-Jun-87	Tube T31	0.94	38	
4A,B	09-Jun-87	Tube T31	1.25	38	254.0 mm
4C,D	09-Jun-87	Tube T32	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
10-Jun-87	10-Jun-87	1	2.239	2.376	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	2.248	2.387	0.004	0.004	0.004
10-Jul-87	10-Jul-87	31	2.265	2.405	0.010	0.011	0.011
10-Aug-87	09-Aug-87	62	2.265	2.405	0.010	0.011	0.011
08-Sep-87	08-Sep-87	91	2.272	2.411	0.013	0.014	0.013
09-Oct-87	09-Oct-87	122	2.268	2.410	0.011	0.013	0.012
09-Dec-87	09-Dec-87	183	2.262	2.403	0.009	0.011	0.010
09-Mar-88	09-Mar-88	274	2.264	2.404	0.010	0.011	0.010
08-Jun-88	08-Jun-88	365	2.265	2.403	0.010	0.011	0.010
07-Dec-88	07-Dec-88	547	2.269	2.409	0.012	0.013	0.012
08-Jun-89	08-Jun-89	730	2.277	2.415	0.015	0.015	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
10-Jun-87	10-Jun-87	1	0.988	0.917	0.000	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.003	0.929	0.006	0.005	0.005	0.005
10-Jul-87	10-Jul-87	31	1.014	0.941	0.010	0.009	0.010	0.010
10-Aug-87	09-Aug-87	62	1.010	0.938	0.009	0.008	0.008	0.010
08-Sep-87	08-Sep-87	91	1.018	0.946	0.012	0.011	0.012	0.013
09-Oct-87	09-Oct-87	122	1.016	0.944	0.011	0.011	0.011	0.012
09-Dec-87	09-Dec-87	183	1.018	0.945	0.012	0.011	0.011	0.011
09-Mar-88	09-Mar-88	274	1.019	0.948	0.012	0.012	0.012	0.011
08-Jun-88	08-Jun-88	365	1.021	0.950	0.013	0.013	0.013	0.012
07-Dec-88	07-Dec-88	547	1.019	0.945	0.012	0.011	0.012	0.012
08-Jun-89	08-Jun-89	730	1.024	0.952	0.014	0.014	0.014	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S2 ASTM C227-87

Type: Natural Sand

Locality: Gagnon Pit

Dates Cast:

			Alk %	Temp C
2A,B	09-Jun-87	Tube T33	0.94	38
2C,D	09-Jun-87	Tube T33	0.94	38
4A,B	09-Jun-87	Tube T32	1.25	38
4C,D	11-Jun-87	Tube T37	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
10-Jun-87	10-Jun-87	1	1.762	1.776	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.778	1.792	0.006	0.006	0.006
10-Jul-87	10-Jul-87	31	1.789	1.801	0.011	0.010	0.010
10-Aug-87	09-Aug-87	62	1.789	1.800	0.011	0.009	0.010
08-Sep-87	08-Sep-87	91	1.792	1.805	0.012	0.011	0.012
09-Oct-87	09-Oct-87	122	1.789	1.801	0.011	0.010	0.010
09-Dec-87	09-Dec-87	183	1.787	1.901	0.010	0.010	0.010
09-Mar-88	09-Mar-88	274	1.786	1.797	0.009	0.008	0.009
08-Jun-88	08-Jun-88	365	1.790	1.805	0.011	0.011	0.011
07-Dec-88	07-Dec-88	547	1.792	1.809	0.012	0.013	0.012
08-Jun-89	08-Jun-89	730	1.803	1.817	0.016	0.016	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
10-Jun-87	10-Jun-87	1	1.652	1.696	0.000	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.669	1.713	0.007	0.007	0.007	0.006
10-Jul-87	10-Jul-87	31	1.678	1.724	0.010	0.011	0.011	0.010
10-Aug-87	09-Aug-87	62	1.679	1.725	0.011	0.011	0.011	0.011
08-Sep-87	08-Sep-87	91	1.682	1.728	0.012	0.013	0.012	0.012
09-Oct-87	09-Oct-87	122	1.679	1.723	0.011	0.011	0.011	0.010
09-Dec-87	09-Dec-87	183	1.677	1.722	0.010	0.010	0.010	0.010
09-Mar-88	09-Mar-88	274	1.674	1.719	0.009	0.009	0.009	0.009
08-Jun-88	08-Jun-88	365	1.681	1.725	0.011	0.011	0.011	0.011
07-Dec-88	07-Dec-88	547	1.681	1.726	0.011	0.012	0.012	0.012
08-Jun-89	08-Jun-89	730	1.691	1.738	0.015	0.017	0.016	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	S2	ASTM C227-87
Type:	Natural Sand	
Locality:	Gagnon Pit	

Dates Cast:			Alk %	Temp C
2A,B	09-Jun-87	Tube T33	0.94	38
2C,D	09-Jun-87	Tube T33	0.94	38
4A,B	09-Jun-87	Tube T32	1.25	38
4C,D	11-Jun-87	Tube T37	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
10-Jun-87	10-Jun-87	1	1.550	1.382	0.000	0.000	0.000
23-Jun-87	23-Jun-87	14	1.573	1.404	0.009	0.009	0.009
10-Jul-87	10-Jul-87	31	1.587	1.419	0.015	0.015	0.015
10-Aug-87	09-Aug-87	62	1.584	1.415	0.013	0.013	0.013
08-Sep-87	08-Sep-87	91	1.591	1.423	0.016	0.016	0.016
09-Oct-87	09-Oct-87	122	1.590	1.420	0.016	0.015	0.015
09-Dec-87	09-Dec-87	183	1.589	1.420	0.015	0.015	0.015
09-Mar-88	09-Mar-88	274	1.589	1.421	0.015	0.015	0.015
08-Jun-88	08-Jun-88	365	1.593	1.421	0.017	0.015	0.016
07-Dec-88	07-Dec-88	547	1.590	1.422	0.016	0.016	0.016
08-Jun-89	08-Jun-89	730	1.597	1.428	0.019	0.018	0.018

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
12-Jun-87	12-Jun-87	1	1.974	2.089	0.000	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.990	2.108	0.006	0.007	0.007	0.008
13-Jul-87	12-Jul-87	32	2.003	2.124	0.011	0.014	0.013	0.014
11-Aug-87	11-Aug-87	61	2.004	2.120	0.012	0.012	0.012	0.013
10-Sep-87	10-Sep-87	91	2.002	2.121	0.011	0.013	0.012	0.014
12-Oct-87	11-Oct-87	123	1.994	2.117	0.008	0.011	0.009	0.012
11-Dec-87	11-Dec-87	183	2.007	2.123	0.013	0.013	0.013	0.014
11-Mar-88	11-Mar-88	274	2.005	2.123	0.012	0.013	0.013	0.014
10-Jun-88	10-Jun-88	365	2.014	2.129	0.016	0.016	0.016	0.016
09-Dec-88	09-Dec-88	547	2.007	2.126	0.013	0.015	0.014	0.015
09-Jun-89	10-Jun-89	729	2.022	2.141	0.019	0.020	0.020	0.019

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S3 ASTM C227-87

Type: Natural Sand

Locality: Boone Pit

Dates Cast:

			Alk %	Temp C
2A,B	10-Jun-87	Tube T34	0.94	38
2C,D	10-Jun-87	Tube T35	0.94	38
4A,B	10-Jun-87	Tube T35	1.25	38
4C,D	10-Jun-87	Tube T35	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
11-Jun-87	11-Jun-87	1	1.209	1.276	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	1.226	1.292	0.007	0.006	0.006
10-Jul-87	11-Jul-87	30	1.238	1.302	0.011	0.010	0.011
10-Aug-87	10-Aug-87	61	1.238	1.303	0.011	0.011	0.011
09-Sep-87	09-Sep-87	91	1.238	1.303	0.011	0.011	0.011
09-Oct-87	10-Oct-87	121	1.236	1.300	0.011	0.009	0.010
10-Dec-87	10-Dec-87	183	1.236	1.302	0.011	0.010	0.010
10-Mar-88	10-Mar-88	274	1.237	1.303	0.011	0.011	0.011
09-Jun-88	09-Jun-88	365	1.240	1.305	0.012	0.011	0.012
08-Dec-88	08-Dec-88	547	1.239	1.306	0.012	0.012	0.012
09-Jun-89	09-Jun-89	730	1.251	1.314	0.017	0.015	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
11-Jun-87	11-Jun-87	1	1.093	1.108	0.000	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	1.103	1.116	0.004	0.003	0.004	0.005
10-Jul-87	11-Jul-87	30	1.114	1.127	0.008	0.007	0.008	0.009
10-Aug-87	10-Aug-87	61	1.110	1.123	0.007	0.006	0.006	0.009
09-Sep-87	09-Sep-87	91	1.112	1.126	0.007	0.007	0.007	0.009
09-Oct-87	10-Oct-87	121	1.114	1.126	0.008	0.007	0.008	0.009
10-Dec-87	10-Dec-87	183	1.115	1.129	0.009	0.008	0.008	0.009
10-Mar-88	10-Mar-88	274	1.112	1.126	0.007	0.007	0.007	0.009
09-Jun-88	09-Jun-88	365	1.115	1.128	0.009	0.008	0.008	0.010
08-Dec-88	08-Dec-88	547	1.115	1.127	0.009	0.007	0.008	0.010
09-Jun-89	09-Jun-89	730	1.124	1.137	0.012	0.011	0.012	0.014

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S3 ASTM C227-87

Type: Natural Sand

Locality: Boone Pit

	Dates Cast:		Alk %	Temp C	Sample Lengths:
2A,B	10-Jun-87	Tube T34	0.94	38	
2C,D	10-Jun-87	Tube T35	0.94	38	
4A,B	10-Jun-87	Tube T35	1.25	38	254.0 mm
4C,D	10-Jun-87	Tube T35	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
11-Jun-87	11-Jun-87	1	2.494	2.509	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	2.520	2.537	0.010	0.011	0.011
10-Jul-87	11-Jul-87	30	2.532	2.550	0.015	0.016	0.016
10-Aug-87	10-Aug-87	61	2.529	2.547	0.014	0.015	0.014
09-Sep-87	09-Sep-87	91	2.534	2.551	0.016	0.017	0.016
09-Oct-87	10-Oct-87	121	2.534	2.552	0.016	0.017	0.016
10-Dec-87	10-Dec-87	183	2.537	2.554	0.017	0.018	0.017
10-Mar-88	10-Mar-88	274	2.536	2.554	0.017	0.018	0.017
09-Jun-88	09-Jun-88	365	2.537	2.554	0.017	0.018	0.017
08-Dec-88	08-Dec-88	547	2.535	2.555	0.016	0.018	0.017
09-Jun-89	09-Jun-89	730	2.544	2.561	0.020	0.020	0.020

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
11-Jun-87	11-Jun-87	1	1.343	1.399	0.000	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	1.384	1.436	0.016	0.015	0.015	0.013
10-Jul-87	11-Jul-87	30	1.395	1.449	0.020	0.020	0.020	0.018
10-Aug-87	10-Aug-87	61	1.383	1.436	0.016	0.015	0.015	0.015
09-Sep-87	09-Sep-87	91	1.396	1.452	0.021	0.021	0.021	0.019
09-Oct-87	10-Oct-87	121	1.397	1.451	0.021	0.020	0.021	0.019
10-Dec-87	10-Dec-87	183	1.397	1.450	0.021	0.020	0.021	0.019
10-Mar-88	10-Mar-88	274	1.395	1.448	0.020	0.019	0.020	0.019
09-Jun-88	09-Jun-88	365	1.400	1.453	0.022	0.021	0.022	0.020
08-Dec-88	08-Dec-88	547	1.399	1.450	0.022	0.020	0.021	0.019
09-Jun-89	09-Jun-89	730	1.404	1.460	0.024	0.024	0.024	0.022

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S4 ASTM C227-87

Type: Natural Sand

Locality: Kirkland Pit

Dates Cast:			Alk %	Temp C
2A,B	10-Jun-87	Tube T36	0.94	38
2C,D	10-Jun-87	Tube T36	0.94	38
4A,B	11-Jun-87	Tube T37	1.25	38
4C,D	11-Jun-87	Tube T37	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
11-Jun-87	11-Jun-87	1	1.779	1.850	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	1.794	1.866	0.006	0.006	0.006
10-Jul-87	11-Jul-87	30	1.804	1.876	0.010	0.010	0.010
10-Aug-87	10-Aug-87	61	1.798	1.870	0.007	0.008	0.008
09-Sep-87	09-Sep-87	91	1.803	1.874	0.009	0.009	0.009
09-Oct-87	10-Oct-87	121	1.799	1.871	0.008	0.008	0.008
10-Dec-87	10-Dec-87	183	1.800	1.871	0.008	0.008	0.008
10-Mar-88	10-Mar-88	274	1.801	1.872	0.009	0.009	0.009
09-Jun-88	09-Jun-88	365	1.804	1.876	0.010	0.010	0.010
08-Dec-88	08-Dec-88	547	1.807	1.875	0.011	0.010	0.010
09-Jun-89	09-Jun-89	730	1.816	1.886	0.015	0.014	0.014

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
11-Jun-87	11-Jun-87	1	1.612	1.760	0.000	0.000	0.000	0.000
24-Jun-87	24-Jun-87	14	1.629	1.772	0.007	0.005	0.006	0.006
10-Jul-87	11-Jul-87	30	1.638	1.783	0.010	0.009	0.010	0.010
10-Aug-87	10-Aug-87	61	1.635	1.780	0.009	0.008	0.008	0.008
09-Sep-87	09-Sep-87	91	1.639	1.783	0.011	0.009	0.010	0.010
09-Oct-87	10-Oct-87	121	1.635	1.780	0.009	0.008	0.008	0.008
10-Dec-87	10-Dec-87	183	1.637	1.781	0.010	0.008	0.009	0.009
10-Mar-88	10-Mar-88	274	1.637	1.781	0.010	0.008	0.009	0.009
09-Jun-88	09-Jun-88	365	1.641	1.784	0.011	0.009	0.010	0.010
08-Dec-88	08-Dec-88	547	1.641	1.785	0.011	0.010	0.011	0.011
09-Jun-89	09-Jun-89	730	1.652	1.796	0.016	0.014	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S4 ASTM C227-87

Type: Natural Sand

Locality: Kirkland Pit

	Dates Cast:		Alk %	Temp C
2A,B	10-Jun-87	Tube T36	0.94	38
2C,D	10-Jun-87	Tube T36	0.94	38
4A,B	11-Jun-87	Tube T37	1.25	38
4C,D	11-Jun-87	Tube T37	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
12-Jun-87	12-Jun-87	1	1.155	1.229	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.181	1.256	0.010	0.011	0.010
13-Jul-87	12-Jul-87	32	1.188	1.264	0.013	0.014	0.013
11-Aug-87	11-Aug-87	61	1.190	1.266	0.014	0.015	0.014
10-Sep-87	10-Sep-87	91	1.187	1.264	0.013	0.014	0.013
12-Oct-87	11-Oct-87	123	1.182	1.259	0.011	0.012	0.011
11-Dec-87	11-Dec-87	183	1.189	1.268	0.013	0.015	0.014
11-Mar-88	11-Mar-88	274	1.187	1.264	0.013	0.014	0.013
10-Jun-88	10-Jun-88	365	1.191	1.268	0.014	0.015	0.015
09-Dec-88	09-Dec-88	547	1.187	1.266	0.013	0.015	0.014
09-Jun-89	10-Jun-89	729	1.199	1.278	0.017	0.019	0.018

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
12-Jun-87	12-Jun-87	1	1.768	1.803	0.000	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.790	1.823	0.009	0.008	0.008	0.009
13-Jul-87	12-Jul-87	32	1.800	1.835	0.013	0.013	0.013	0.013
11-Aug-87	11-Aug-87	61	1.802	1.838	0.013	0.014	0.014	0.014
10-Sep-87	10-Sep-87	91	1.801	1.837	0.013	0.013	0.013	0.013
12-Oct-87	11-Oct-87	123	1.797	1.832	0.011	0.011	0.011	0.011
11-Dec-87	11-Dec-87	183	1.802	1.838	0.013	0.014	0.014	0.014
11-Mar-88	11-Mar-88	274	1.801	1.835	0.013	0.013	0.013	0.013
10-Jun-88	10-Jun-88	365	1.805	1.840	0.015	0.015	0.015	0.015
09-Dec-88	09-Dec-88	547	1.802	1.837	0.013	0.013	0.013	0.013
09-Jun-89	10-Jun-89	729	1.813	1.850	0.018	0.019	0.018	0.018

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S5 ASTM C227-87

Type: Natural Sand

Locality: Zealand Pit

	Dates Cast:		Alk %	Temp C
2A,B	11-Jun-87	Tube T38	0.94	38
2C,D	11-Jun-87	Tube T38	0.94	38
4A,B	11-Jun-87	Tube T38	1.25	38
4C,D	11-Jun-87	Tube T39	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
12-Jun-87	12-Jun-87	1	1.233	1.386	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.250	1.409	0.007	0.009	0.008
13-Jul-87	12-Jul-87	32	1.263	1.418	0.012	0.013	0.012
11-Aug-87	11-Aug-87	61	1.265	1.421	0.013	0.014	0.013
10-Sep-87	10-Sep-87	91	1.260	1.419	0.011	0.013	0.012
12-Oct-87	11-Oct-87	123	1.253	1.408	0.008	0.009	0.008
11-Dec-87	11-Dec-87	183	1.263	1.422	0.012	0.014	0.013
11-Mar-88	11-Mar-88	274	1.263	1.422	0.012	0.014	0.013
10-Jun-88	10-Jun-88	365	1.267	1.427	0.013	0.016	0.015
09-Dec-88	09-Dec-88	547	1.262	1.423	0.011	0.015	0.013
09-Jun-89	10-Jun-89	729	1.268	1.432	0.014	0.018	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
12-Jun-87	12-Jun-87	1	1.075	0.689	0.000	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.084	0.704	0.004	0.006	0.005	0.006
13-Jul-87	12-Jul-87	32	1.105	0.713	0.012	0.009	0.011	0.011
11-Aug-87	11-Aug-87	61	1.106	0.715	0.012	0.010	0.011	0.012
10-Sep-87	10-Sep-87	91	1.097	0.712	0.009	0.009	0.009	0.010
12-Oct-87	11-Oct-87	123	1.084	0.712	0.004	0.009	0.006	0.007
11-Dec-87	11-Dec-87	183	1.102	0.717	0.011	0.011	0.011	0.012
11-Mar-88	11-Mar-88	274	1.099	0.716	0.009	0.011	0.010	0.012
10-Jun-88	10-Jun-88	365	1.104	0.720	0.011	0.012	0.012	0.013
09-Dec-88	09-Dec-88	547	1.101	0.715	0.010	0.010	0.010	0.012
09-Jun-89	10-Jun-89	729	1.107	0.724	0.013	0.014	0.013	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S5 ASTM C227-87

Type: Natural Sand

Locality: Zealand Pit

Dates Cast:

			Alk %	Temp C
2A,B	11-Jun-87	Tube T38	0.94	38
2C,D	11-Jun-87	Tube T38	0.94	38
4A,B	11-Jun-87	Tube T38	1.25	38
4C,D	11-Jun-87	Tube T39	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
12-Jun-87	12-Jun-87	1	2.518	2.350	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	2.531	2.374	0.005	0.009	0.007
13-Jul-87	12-Jul-87	32	2.543	2.384	0.010	0.013	0.012
11-Aug-87	11-Aug-87	61	2.545	2.390	0.011	0.016	0.013
10-Sep-87	10-Sep-87	91	2.542	2.387	0.009	0.015	0.012
12-Oct-87	11-Oct-87	123	2.540	2.381	0.009	0.012	0.010
11-Dec-87	11-Dec-87	183	2.546	2.389	0.011	0.015	0.013
11-Mar-88	11-Mar-88	274	2.545	2.390	0.011	0.016	0.013
10-Jun-88	10-Jun-88	365	2.550	2.391	0.013	0.016	0.014
09-Dec-88	09-Dec-88	547	2.545	2.388	0.011	0.015	0.013
09-Jun-89	10-Jun-89	729	2.552	2.394	0.013	0.017	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
12-Jun-87	12-Jun-87	1	1.252	1.329	0.000	0.000	0.000	0.000
04-Apr-87	25-Jun-87	14	1.269	1.346	0.007	0.007	0.007	0.007
13-Jul-87	12-Jul-87	32	1.280	1.358	0.011	0.011	0.011	0.011
11-Aug-87	11-Aug-87	61	1.280	1.361	0.011	0.013	0.012	0.013
10-Sep-87	10-Sep-87	91	1.282	1.360	0.012	0.012	0.012	0.012
12-Oct-87	11-Oct-87	123	1.280	1.357	0.011	0.011	0.011	0.011
11-Dec-87	11-Dec-87	183	1.285	1.364	0.013	0.014	0.013	0.013
11-Mar-88	11-Mar-88	274	1.282	1.362	0.012	0.013	0.012	0.013
10-Jun-88	10-Jun-88	365	1.285	1.367	0.013	0.015	0.014	0.014
09-Dec-88	09-Dec-88	547	1.282	1.360	0.012	0.012	0.012	0.012
09-Jun-89	10-Jun-89	729	1.293	1.371	0.016	0.017	0.016	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S6 ASTM C227-87

Type: Natural Sand

Locality: Shaddick Pit

Dates Cast:

			Alk %	Temp C
2A,B	11-Jun-87	Tube T39	0.94	38
2C,D	11-Jun-87	Tube T39	0.94	38
4A,B	12-Jun-87	Tube T40	1.25	38
4C,D	12-Jun-87	Tube T40	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
12-Jun-87	12-Jun-87	1	2.243	1.965	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	2.260	1.983	0.007	0.007	0.007
13-Jul-87	12-Jul-87	32	2.270	1.993	0.011	0.011	0.011
11-Aug-87	11-Aug-87	61	2.274	1.997	0.012	0.013	0.012
10-Sep-87	10-Sep-87	91	2.271	1.993	0.011	0.011	0.011
12-Oct-87	11-Oct-87	123	2.261	1.993	0.007	0.011	0.009
11-Dec-87	11-Dec-87	183	2.273	1.995	0.012	0.012	0.012
11-Mar-88	11-Mar-88	274	2.273	1.995	0.012	0.012	0.012
10-Jun-88	10-Jun-88	365	2.278	2.001	0.014	0.014	0.014
09-Dec-88	09-Dec-88	547	2.267	1.993	0.009	0.011	0.010
09-Jun-89	10-Jun-89	729	2.281	2.002	0.015	0.015	0.015

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
12-Jun-87	12-Jun-87	1	1.719	1.629	0.000	0.000	0.000	0.000
25-Jun-87	25-Jun-87	14	1.740	1.648	0.008	0.007	0.008	0.007
13-Jul-87	12-Jul-87	32	1.754	1.661	0.014	0.013	0.013	0.012
11-Aug-87	11-Aug-87	61	1.757	1.664	0.015	0.014	0.014	0.013
10-Sep-87	10-Sep-87	91	1.755	1.663	0.014	0.013	0.014	0.012
12-Oct-87	11-Oct-87	123	1.750	1.661	0.012	0.013	0.012	0.011
11-Dec-87	11-Dec-87	183	1.757	1.666	0.015	0.015	0.015	0.013
11-Mar-88	11-Mar-88	274	1.757	1.663	0.015	0.013	0.014	0.013
10-Jun-88	10-Jun-88	365	1.760	1.666	0.016	0.015	0.015	0.015
09-Dec-88	09-Dec-88	547	1.757	1.662	0.015	0.013	0.014	0.012
09-Jun-89	10-Jun-89	729	1.765	1.672	0.018	0.017	0.018	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	S6	ASTM C227-87		
Type:	Natural Sand			
Locality:	Shaddick Pit			

	Dates Cast:		Alk %	Temp C	Sample Lengths:
2A,B	11-Jun-87	Tube T39	0.94	38	
2C,D	11-Jun-87	Tube T39	0.94	38	
4A,B	12-Jun-87	Tube T40	1.25	38	254.0 mm
4C,D	12-Jun-87	Tube T40	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
13-Jun-87	13-Jun-87	1	1.557	1.336	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	1.594	1.375	0.015	0.015	0.015
13-Jul-87	13-Jul-87	31	1.598	1.380	0.016	0.017	0.017
12-Aug-87	12-Aug-87	61	1.601	1.382	0.017	0.018	0.018
11-Sep-87	11-Sep-87	91	1.612	1.396	0.022	0.024	0.023
12-Oct-87	12-Oct-87	122	1.600	1.385	0.017	0.019	0.018
11-Dec-87	12-Dec-87	182	1.606	1.388	0.019	0.020	0.020
12-Mar-88	12-Mar-88	274	1.606	1.388	0.019	0.020	0.020
10-Jun-88	11-Jun-88	364	1.610	1.392	0.021	0.022	0.021
09-Dec-88	10-Dec-88	546	1.601	1.394	0.017	0.023	0.020
12-Jun-89	11-Jun-89	731	1.609	1.392	0.020	0.022	0.021

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
13-Jun-87	13-Jun-87	1	1.947	1.964	0.000	0.000	0.000	0.000
04-Apr-87	26-Jun-87	14	1.984	2.001	0.015	0.015	0.015	0.015
13-Jul-87	13-Jul-87	31	1.990	2.007	0.017	0.017	0.017	0.017
12-Aug-87	12-Aug-87	61	1.991	2.009	0.017	0.018	0.018	0.018
11-Sep-87	11-Sep-87	91	2.002	2.020	0.022	0.022	0.022	0.022
12-Oct-87	12-Oct-87	122	1.990	2.009	0.017	0.018	0.017	0.018
11-Dec-87	12-Dec-87	182	1.997	2.013	0.020	0.019	0.019	0.020
12-Mar-88	12-Mar-88	274	1.995	2.014	0.019	0.020	0.019	0.020
10-Jun-88	11-Jun-88	364	1.997	2.015	0.020	0.020	0.020	0.021
09-Dec-88	10-Dec-88	546	1.995	2.011	0.019	0.019	0.019	0.019
12-Jun-89	11-Jun-89	731	1.999	2.013	0.020	0.019	0.020	0.021

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:		S7	ASTM 227-87		
Type:		Natural Sand			
Locality:		Blue Mt. Pit			
Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	12-Jun-87	Tube T40	0.94	38	
2C,D	12-Jun-87	Tube T41	0.94	38	
4A,B	12-Jun-87	Tube T41	1.25	38	254.0 mm
4C,D	12-Jun-87	Tube T41	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
13-Jun-87	13-Jun-87	1	2.155	2.368	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	2.180	2.401	0.010	0.013	0.011
13-Jul-87	13-Jul-87	31	2.184	2.407	0.011	0.015	0.013
12-Aug-87	12-Aug-87	61	2.182	2.406	0.011	0.015	0.013
11-Sep-87	11-Sep-87	91	2.197	2.413	0.017	0.018	0.017
12-Oct-87	12-Oct-87	122	2.181	2.395	0.010	0.011	0.010
11-Dec-87	12-Dec-87	182	2.186	2.397	0.012	0.011	0.012
12-Mar-88	12-Mar-88	274	2.189	2.400	0.013	0.013	0.013
10-Jun-88	11-Jun-88	364	2.191	2.402	0.014	0.013	0.014
09-Dec-88	10-Dec-88	546	2.185	2.396	0.012	0.011	0.011
12-Jun-89	11-Jun-89	731	2.189	2.401	0.013	0.013	0.013

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
13-Jun-87	13-Jun-87	1	1.219	1.408	0.000	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	1.253	1.433	0.013	0.010	0.012	0.012
13-Jul-87	13-Jul-87	31	1.264	1.444	0.018	0.014	0.016	0.015
12-Aug-87	12-Aug-87	61	1.257	1.438	0.015	0.012	0.013	0.013
11-Sep-87	11-Sep-87	91	1.258	1.439	0.015	0.012	0.014	0.015
12-Oct-87	12-Oct-87	122	1.258	1.437	0.015	0.011	0.013	0.012
11-Dec-87	12-Dec-87	182	1.263	1.442	0.017	0.013	0.015	0.014
12-Mar-88	12-Mar-88	274	1.258	1.438	0.015	0.012	0.014	0.013
10-Jun-88	11-Jun-88	364	1.266	1.447	0.019	0.015	0.017	0.015
09-Dec-88	10-Dec-88	546	1.265	1.445	0.018	0.015	0.016	0.014
12-Jun-89	11-Jun-89	731	1.269	1.449	0.020	0.016	0.018	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S7 ASTM 227-87

Type: Natural Sand

Locality: Blue Mt. Pit

Dates Cast:			Alk %	Temp C
2A,B	12-Jun-87	Tube T40	0.94	38
2C,D	12-Jun-87	Tube T41	0.94	38
4A,B	12-Jun-87	Tube T41	1.25	38
4C,D	12-Jun-87	Tube T41	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
13-Jun-87	13-Jun-87	1	1.253	1.329	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	1.284	1.353	0.012	0.009	0.011
13-Jul-87	13-Jul-87	31	1.296	1.363	0.017	0.013	0.015
12-Aug-87	12-Aug-87	61	1.295	1.362	0.017	0.013	0.015
11-Sep-87	11-Sep-87	91	1.295	1.361	0.017	0.013	0.015
12-Oct-87	12-Oct-87	122	1.292	1.358	0.015	0.011	0.013
11-Dec-87	12-Dec-87	182	1.298	1.366	0.018	0.015	0.016
12-Mar-88	12-Mar-88	274	1.295	1.361	0.017	0.013	0.015
10-Jun-88	11-Jun-88	364	1.301	1.368	0.019	0.015	0.017
09-Dec-88	10-Dec-88	546	1.298	1.364	0.018	0.014	0.016
12-Jun-89	11-Jun-89	731	1.298	1.369	0.018	0.016	0.017

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
13-Jun-87	13-Jun-87	1	2.388	2.421	0.000	0.000	0.000	0.000
04-Apr-87	26-Jun-87	14	2.411	2.442	0.009	0.008	0.009	0.010
13-Jul-87	13-Jul-87	31	2.423	2.451	0.014	0.012	0.013	0.014
12-Aug-87	12-Aug-87	61	2.419	2.448	0.012	0.011	0.011	0.013
11-Sep-87	11-Sep-87	91	2.418	2.447	0.012	0.010	0.011	0.013
12-Oct-87	12-Oct-87	122	2.418	2.447	0.012	0.010	0.011	0.012
11-Dec-87	12-Dec-87	182	2.427	2.454	0.015	0.013	0.014	0.015
12-Mar-88	12-Mar-88	274	2.423	2.452	0.014	0.012	0.013	0.014
10-Jun-88	11-Jun-88	364	2.429	2.458	0.016	0.015	0.015	0.016
09-Dec-88	10-Dec-88	546	2.426	2.454	0.015	0.013	0.014	0.015
12-Jun-89	11-Jun-89	731	2.431	2.457	0.017	0.014	0.016	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S8 ASTM C227-87

Type: Natural Sand

Locality: Gloucester Pit

Dates Cast:			Alk %	Temp C
2A,B	12-Jun-87	Tube T42	0.94	38
2C,D	12-Jun-87	Tube T42	0.94	38
4A,B	12-Jun-87	Tube T42	1.25	38
4C,D	15-Jun-87	Tube T43	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
13-Jun-87	13-Jun-87	1	1.400	1.313	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	1.418	1.332	0.007	0.007	0.007
13-Jul-87	13-Jul-87	31	1.426	1.343	0.010	0.012	0.011
12-Aug-87	12-Aug-87	61	1.419	1.334	0.007	0.008	0.008
11-Sep-87	11-Sep-87	91	1.395	1.310	-0.002	-0.001	-0.002
12-Oct-87	12-Oct-87	122	1.422	1.334	0.009	0.008	0.008
11-Dec-87	12-Dec-87	182	1.424	1.336	0.009	0.009	0.009
12-Mar-88	12-Mar-88	274	1.421	1.333	0.008	0.008	0.008
10-Jun-88	11-Jun-88	364	1.425	1.338	0.010	0.010	0.010
09-Dec-88	10-Dec-88	546	1.417	1.331	0.007	0.007	0.007
12-Jun-89	11-Jun-89	731	1.424	1.337	0.009	0.009	0.009

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
13-Jun-87	13-Jun-87	1	2.041	1.797	0.000	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	2.058	1.825	0.007	0.011	0.009	0.008
13-Jul-87	13-Jul-87	31	2.065	1.828	0.009	0.012	0.011	0.011
12-Aug-87	12-Aug-87	61	2.060	1.825	0.007	0.011	0.009	0.009
11-Sep-87	11-Sep-87	91	2.036	1.802	-0.002	0.002	.000	-0.001
12-Oct-87	12-Oct-87	122	2.061	1.825	0.008	0.011	0.009	0.009
11-Dec-87	12-Dec-87	182	2.063	1.829	0.009	0.013	0.011	0.010
12-Mar-88	12-Mar-88	274	2.060	1.826	0.007	0.011	0.009	0.009
10-Jun-88	11-Jun-88	364	2.065	1.831	0.009	0.013	0.011	0.011
09-Dec-88	10-Dec-88	546	2.062	1.825	0.008	0.011	0.010	0.008
12-Jun-89	11-Jun-89	731	2.064	1.832	0.009	0.014	0.011	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S8 ASTM C227-87

Type: Natural Sand

Locality: Gloucester Pit

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	12-Jun-87	Tube T42	0.94	38	
2C,D	12-Jun-87	Tube T42	0.94	38	
4A,B	12-Jun-87	Tube T42	1.25	38	254.0 mm
4C,D	15-Jun-87	Tube T43	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
13-Jun-87	13-Jun-87	1	1.697	1.757	0.000	0.000	0.000
26-Jun-87	26-Jun-87	14	1.719	1.779	0.009	0.009	0.009
13-Jul-87	13-Jul-87	31	1.729	1.786	0.013	0.011	0.012
12-Aug-87	12-Aug-87	61	1.722	1.783	0.010	0.010	0.010
11-Sep-87	11-Sep-87	91	1.706	1.766	0.004	0.004	0.004
12-Oct-87	12-Oct-87	122	1.724	1.783	0.011	0.010	0.010
11-Dec-87	12-Dec-87	182	1.730	1.791	0.013	0.013	0.013
12-Mar-88	12-Mar-88	274	1.727	1.792	0.012	0.014	0.013
10-Jun-88	11-Jun-88	364	1.731	1.791	0.013	0.013	0.013
09-Dec-88	10-Dec-88	546	1.725	1.788	0.011	0.012	0.012
12-Jun-89	11-Jun-89	731	1.730	1.793	0.013	0.014	0.014

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
16-Jun-87	16-Jun-87	1	1.806	1.675	0.000	0.000	0.000	0.000
04-Apr-87	29-Jun-87	14	1.836	1.702	0.012	0.011	0.011	0.010
16-Jul-87	16-Jul-87	31	1.839	1.704	0.013	0.011	0.012	0.012
14-Aug-87	15-Aug-87	60	1.845	1.712	0.015	0.015	0.015	0.012
14-Sep-87	14-Sep-87	91	1.844	1.711	0.015	0.014	0.015	0.009
15-Oct-87	15-Oct-87	122	1.848	1.715	0.017	0.016	0.016	0.013
15-Dec-87	15-Dec-87	183	1.847	1.714	0.016	0.015	0.016	0.014
15-Mar-88	15-Mar-88	274	1.847	1.715	0.016	0.016	0.016	0.014
14-Jun-88	14-Jun-88	365	1.850	1.717	0.017	0.017	0.017	0.015
13-Dec-88	13-Dec-88	547	1.842	1.709	0.014	0.013	0.014	0.013
14-Jun-89	14-Jun-89	730	1.848	1.717	0.017	0.017	0.017	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S9 ASTM C227-87

Type: Natural Sand

Locality: Valley Road Pit

Dates Cast:

			Alk %	Temp C
2A,B	15-Jun-87	Tube T43	0.94	38
2C,D	15-Jun-87	Tube T43	0.94	38
4A,B	15-Jun-87	Tube T44	1.25	38
4C,D	15-Jun-87	Tube T44	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
16-Jun-87	16-Jun-87	1	1.956	1.738	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.982	1.765	0.010	0.011	0.010
16-Jul-87	16-Jul-87	31	1.983	1.767	0.011	0.011	0.011
14-Aug-87	15-Aug-87	60	1.989	1.770	0.013	0.013	0.013
14-Sep-87	14-Sep-87	91	1.988	1.771	0.013	0.013	0.013
15-Oct-87	15-Oct-87	122	1.989	1.771	0.013	0.013	0.013
15-Dec-87	15-Dec-87	183	1.989	1.773	0.013	0.014	0.013
15-Mar-88	15-Mar-88	274	1.990	1.772	0.013	0.013	0.013
14-Jun-88	14-Jun-88	365	1.995	1.773	0.015	0.014	0.015
13-Dec-88	13-Dec-88	547	1.989	1.770	0.013	0.013	0.013
14-Jun-89	14-Jun-89	730	1.997	1.777	0.016	0.015	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
16-Jun-87	16-Jun-87	1	1.412	1.448	0.000	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.436	1.472	0.009	0.009	0.009	0.010
16-Jul-87	16-Jul-87	31	1.438	1.473	0.010	0.010	0.010	0.011
14-Aug-87	15-Aug-87	60	1.443	1.478	0.012	0.012	0.012	0.012
14-Sep-87	14-Sep-87	91	1.443	1.477	0.012	0.011	0.012	0.012
15-Oct-87	15-Oct-87	122	1.445	1.479	0.013	0.012	0.013	0.013
15-Dec-87	15-Dec-87	183	1.446	1.479	0.013	0.012	0.013	0.013
15-Mar-88	15-Mar-88	274	1.445	1.480	0.013	0.013	0.013	0.013
14-Jun-88	14-Jun-88	365	1.450	1.485	0.015	0.015	0.015	0.015
14-Dec-88	13-Dec-88	548	1.443	1.479	0.012	0.012	0.012	0.013
13-Jun-89	14-Jun-89	729	1.448	1.484	0.014	0.014	0.014	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S9 ASTM C227-87

Type: Natural Sand

Locality: Valley Road Pit

Dates Cast:

			Alk %	Temp C
2A,B	15-Jun-87	Tube T43	0.94	38
2C,D	15-Jun-87	Tube T43	0.94	38
4A,B	15-Jun-87	Tube T44	1.25	38
4C,D	15-Jun-87	Tube T44	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
16-Jun-87	16-Jun-87	1	1.558	1.692	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.588	1.722	0.012	0.012	0.012
16-Jul-87	16-Jul-87	31	1.589	1.723	0.012	0.012	0.012
14-Aug-87	15-Aug-87	60	1.596	1.731	0.015	0.015	0.015
14-Sep-87	14-Sep-87	91	1.599	1.732	0.016	0.016	0.016
15-Oct-87	15-Oct-87	122	1.601	1.733	0.017	0.016	0.017
15-Dec-87	15-Dec-87	183	1.601	1.734	0.017	0.017	0.017
15-Mar-88	15-Mar-88	274	1.603	1.735	0.018	0.017	0.017
14-Jun-88	14-Jun-88	365	1.606	1.739	0.019	0.019	0.019
13-Dec-88	13-Dec-88	547	1.600	1.732	0.017	0.016	0.016
14-Jun-89	14-Jun-89	730	1.606	1.738	0.019	0.018	0.019

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
16-Jun-87	16-Jun-87	1	1.177	1.189	0.000	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.205	1.216	0.011	0.011	0.011	0.011
16-Jul-87	16-Jul-87	31	1.210	1.222	0.013	0.013	0.013	0.013
14-Aug-87	15-Aug-87	60	1.215	1.226	0.015	0.015	0.015	0.015
14-Sep-87	14-Sep-87	91	1.216	1.227	0.015	0.015	0.015	0.016
15-Oct-87	15-Oct-87	122	1.219	1.230	0.017	0.016	0.016	0.016
15-Dec-87	15-Dec-87	183	1.219	1.229	0.017	0.016	0.016	0.016
15-Mar-88	15-Mar-88	274	1.220	1.231	0.017	0.017	0.017	0.017
14-Jun-88	14-Jun-88	365	1.225	1.235	0.019	0.018	0.019	0.019
13-Dec-88	13-Dec-88	547	1.217	1.233	0.016	0.017	0.017	0.016
14-Jun-89	14-Jun-89	730	1.222	1.237	0.018	0.019	0.018	0.018

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S10 ASTM C227-87

Type: Natural Sand

Locality: Blagdon Pit

Dates Cast:

			Alk %	Temp C
2A,B	15-Jun-87	Tube T44	0.94	38
2C,D	15-Jun-87	Tube T45	0.94	38
4A,B	15-Jun-87	Tube T45	1.25	38
4C,D	15-Jun-87	Tube T45	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
16-Jun-87	16-Jun-87	1	2.613	2.557	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	2.630	2.575	0.007	0.007	0.007
16-Jul-87	16-Jul-87	31	2.631	2.581	0.007	0.009	0.008
14-Aug-87	15-Aug-87	60	2.637	2.581	0.009	0.009	0.009
14-Sep-87	14-Sep-87	91	2.637	2.580	0.009	0.009	0.009
15-Oct-87	15-Oct-87	122	2.639	2.582	0.010	0.010	0.010
15-Dec-87	15-Dec-87	183	2.637	2.581	0.009	0.009	0.009
15-Mar-88	15-Mar-88	274	2.639	2.582	0.010	0.010	0.010
14-Jun-88	14-Jun-88	365	2.645	2.587	0.013	0.012	0.012
13-Dec-88	13-Dec-88	547	2.639	2.581	0.010	0.009	0.010
14-Jun-89	14-Jun-89	730	2.644	2.587	0.012	0.012	0.012

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
16-Jun-87	16-Jun-87	1	1.204	1.228	0.000	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.233	1.259	0.011	0.012	0.012	0.009
16-Jul-87	16-Jul-87	31	1.233	1.258	0.011	0.012	0.012	0.010
14-Aug-87	15-Aug-87	60	1.239	1.260	0.014	0.013	0.013	0.011
14-Sep-87	14-Sep-87	91	1.241	1.265	0.015	0.015	0.015	0.012
15-Oct-87	15-Oct-87	122	1.241	1.266	0.015	0.015	0.015	0.012
15-Dec-87	15-Dec-87	183	1.239	1.265	0.014	0.015	0.014	0.012
15-Mar-88	15-Mar-88	274	1.244	1.263	0.016	0.014	0.015	0.012
14-Jun-88	14-Jun-88	365	1.245	1.271	0.016	0.017	0.017	0.014
13-Dec-88	13-Dec-88	547	1.240	1.259	0.014	0.012	0.013	0.012
14-Jun-89	14-Jun-89	730	1.245	1.265	0.016	0.015	0.015	0.014

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S10 ASTM C227-87

Type: Natural Sand

Locality: Blagdon Pit

Dates Cast:

			Alk %	Temp C
2A,B	15-Jun-87	Tube T44	0.94	38
2C,D	15-Jun-87	Tube T45	0.94	38
4A,B	15-Jun-87	Tube T45	1.25	38
4C,D	15-Jun-87	Tube T45	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
16-Jun-87	16-Jun-87	1	1.790	2.092	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	1.814	2.117	0.009	0.010	0.010
16-Jul-87	16-Jul-87	31	1.819	2.122	0.011	0.012	0.012
14-Aug-87	15-Aug-87	60	1.826	2.126	0.014	0.013	0.014
14-Sep-87	14-Sep-87	91	1.827	2.128	0.015	0.014	0.014
15-Oct-87	15-Oct-87	122	1.829	2.131	0.015	0.015	0.015
15-Dec-87	15-Dec-87	183	1.826	2.128	0.014	0.014	0.014
15-Mar-88	15-Mar-88	274	1.829	2.128	0.015	0.014	0.015
14-Jun-88	14-Jun-88	365	1.835	2.139	0.018	0.019	0.018
13-Dec-88	13-Dec-88	547	1.826	2.130	0.014	0.015	0.015
14-Jun-89	14-Jun-89	730	1.829	2.134	0.015	0.017	0.016

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
16-Jun-87	16-Jun-87	1	2.589	2.187	0.000	0.000	0.000	0.000
29-Jun-87	29-Jun-87	14	2.611	2.211	0.009	0.009	0.009	0.009
16-Jul-87	16-Jul-87	31	2.615	2.227	0.010	0.016	0.013	0.012
14-Aug-87	15-Aug-87	60	2.621	2.220	0.013	0.013	0.013	0.013
14-Sep-87	14-Sep-87	91	2.627	2.222	0.015	0.014	0.014	0.014
15-Oct-87	15-Oct-87	122	2.626	2.224	0.015	0.015	0.015	0.015
15-Dec-87	15-Dec-87	183	2.623	2.222	0.013	0.014	0.014	0.014
15-Mar-88	15-Mar-88	274	2.623	2.222	0.013	0.014	0.014	0.014
14-Jun-88	14-Jun-88	365	2.629	2.225	0.016	0.015	0.015	0.017
13-Dec-88	13-Dec-88	547	2.620	2.218	0.012	0.012	0.012	0.013
14-Jun-89	14-Jun-89	730	2.626	2.226	0.015	0.015	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	S11	ASTM C227-87
Type:	Natural Sand	
Locality:	Chitticks Old Pit	

Dates Cast:

			Alk %	Temp C	Sample Lengths:
2A,B	16-Jun-87	Tube T46	0.94	38	
2C,D	16-Jun-87	Tube T46	0.94	38	
4A,B	16-Jun-87	Tube T46	1.25	38	254.0 mm
4C,D	16-Jun-87	Tube T47	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
17-Jun-87	17-Jun-87	1	1.626	1.741	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	1.651	1.770	0.010	0.011	0.011
17-Jul-87	17-Jul-87	31	1.654	1.772	0.011	0.012	0.012
17-Aug-87	16-Aug-87	62	1.664	1.782	0.015	0.016	0.016
15-Sep-87	15-Sep-87	91	1.662	1.780	0.014	0.015	0.015
16-Oct-87	16-Oct-87	122	1.662	1.780	0.014	0.015	0.015
16-Dec-87	16-Dec-87	183	1.662	1.781	0.014	0.016	0.015
16-Mar-88	16-Mar-88	274	1.664	1.781	0.015	0.016	0.015
15-Jun-88	15-Jun-88	365	1.664	1.783	0.015	0.017	0.016
14-Dec-88	14-Dec-88	547	1.663	1.782	0.015	0.016	0.015
15-Jun-89	15-Jun-89	730	1.667	1.787	0.016	0.018	0.017

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
17-Jun-87	17-Jun-87	1	2.064	1.833	0.000	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	2.093	1.861	0.011	0.011	0.011	0.011
17-Jul-87	17-Jul-87	31	2.097	1.865	0.013	0.013	0.013	0.012
17-Aug-87	16-Aug-87	62	2.105	1.873	0.016	0.016	0.016	0.016
15-Sep-87	15-Sep-87	91	2.103	1.871	0.015	0.015	0.015	0.015
16-Oct-87	16-Oct-87	122	2.104	1.870	0.016	0.015	0.015	0.015
16-Dec-87	16-Dec-87	183	2.105	1.872	0.016	0.015	0.016	0.015
16-Mar-88	16-Mar-88	274	2.105	1.874	0.016	0.016	0.016	0.016
15-Jun-88	15-Jun-88	365	2.107	1.869	0.017	0.014	0.016	0.016
14-Dec-88	14-Dec-88	547	2.105	1.872	0.016	0.015	0.016	0.016
15-Jun-89	15-Jun-89	730	2.110	1.877	0.018	0.017	0.018	0.017

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S11 ASTM C227-87

Type: Natural Sand

Locality: Chitticks Old Pit

Dates Cast:

			Alk %	Temp C
2A,B	16-Jun-87	Tube T46	0.94	38
2C,D	16-Jun-87	Tube T46	0.94	38
4A,B	16-Jun-87	Tube T46	1.25	38
4C,D	16-Jun-87	Tube T47	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
17-Jun-87	17-Jun-87	1	1.158	1.134	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	1.186	1.163	0.011	0.011	0.011
17-Jul-87	17-Jul-87	31	1.191	1.167	0.013	0.013	0.013
17-Aug-87	16-Aug-87	62	1.201	1.177	0.017	0.017	0.017
15-Sep-87	15-Sep-87	91	1.200	1.174	0.017	0.016	0.016
16-Oct-87	16-Oct-87	122	1.203	1.174	0.018	0.016	0.017
16-Dec-87	16-Dec-87	183	1.201	1.174	0.017	0.016	0.016
16-Mar-88	16-Mar-88	274	1.201	1.174	0.017	0.016	0.016
15-Jun-88	15-Jun-88	365	1.201	1.174	0.017	0.016	0.016
14-Dec-88	14-Dec-88	547	1.203	1.176	0.018	0.017	0.017
15-Jun-89	15-Jun-89	730	1.206	1.182	0.019	0.019	0.019

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
17-Jun-87	17-Jun-87	1	1.536	1.430	0.000	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	1.573	1.468	0.015	0.015	0.015	0.013
17-Jul-87	17-Jul-87	31	1.576	1.472	0.016	0.017	0.016	0.015
17-Aug-87	16-Aug-87	62	1.588	1.485	0.020	0.022	0.021	0.019
15-Sep-87	15-Sep-87	91	1.589	1.485	0.021	0.022	0.021	0.019
16-Oct-87	16-Oct-87	122	1.590	1.485	0.021	0.022	0.021	0.019
16-Dec-87	16-Dec-87	183	1.590	1.487	0.021	0.022	0.022	0.019
16-Mar-88	16-Mar-88	274	1.588	1.485	0.020	0.022	0.021	0.019
15-Jun-88	15-Jun-88	365	1.583	1.484	0.019	0.021	0.020	0.018
14-Dec-88	14-Dec-88	547	1.587	1.482	0.020	0.020	0.020	0.019
15-Jun-89	15-Jun-89	730	1.592	1.487	0.022	0.022	0.022	0.021

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S12 ASTM C227-87

Type: Natural Sand

Locality: Likley's Beach

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	16-Jun-87	Tube T47	0.94	38	
2C,D	16-Jun-87	Tube T47	0.94	38	
4A,B	16-Jun-87	Tube T48	1.25	38	254.0 mm
4C,D	16-Jun-87	Tube T48	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
17-Jun-87	17-Jun-87	1	1.234	1.144	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	1.276	1.185	0.017	0.016	0.016
17-Jul-87	17-Jul-87	31	1.279	1.187	0.018	0.017	0.017
17-Aug-87	16-Aug-87	62	1.291	1.202	0.022	0.023	0.023
15-Sep-87	15-Sep-87	91	1.294	1.203	0.024	0.023	0.023
16-Oct-87	16-Oct-87	122	1.292	1.203	0.023	0.023	0.023
16-Dec-87	16-Dec-87	183	1.294	1.205	0.024	0.024	0.024
16-Mar-88	16-Mar-88	274	1.294	1.204	0.024	0.024	0.024
15-Jun-88	15-Jun-88	365	1.291	1.201	0.022	0.022	0.022
14-Dec-88	14-Dec-88	547	1.294	1.204	0.024	0.024	0.024
15-Jun-89	15-Jun-89	730	1.299	1.208	0.026	0.025	0.025

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
17-Jun-87	17-Jun-87	1	2.416	2.488	0.000	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	2.456	2.528	0.016	0.016	0.016	0.016
17-Jul-87	17-Jul-87	31	2.460	2.531	0.017	0.017	0.017	0.017
17-Aug-87	16-Aug-87	62	2.470	2.542	0.021	0.021	0.021	0.022
15-Sep-87	15-Sep-87	91	2.469	2.541	0.021	0.021	0.021	0.022
16-Oct-87	16-Oct-87	122	2.470	2.542	0.021	0.021	0.021	0.022
16-Dec-87	16-Dec-87	183	2.471	2.543	0.022	0.022	0.022	0.023
16-Mar-88	16-Mar-88	274	2.475	2.541	0.023	0.021	0.022	0.023
15-Jun-88	15-Jun-88	365	2.469	2.540	0.021	0.020	0.021	0.022
14-Dec-88	14-Dec-88	547	2.472	2.544	0.022	0.022	0.022	0.023
15-Jun-89	15-Jun-89	730	2.480	2.549	0.025	0.024	0.025	0.025

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S12 ASTM C227-87

Type: Natural Sand

Locality: Likley's Beach

Dates Cast:

			Alk %	Temp C
2A,B	16-Jun-87	Tube T47	0.94	38
2C,D	16-Jun-87	Tube T47	0.94	38
4A,B	16-Jun-87	Tube T48	1.25	38
4C,D	16-Jun-87	Tube T48	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
17-Jun-87	17-Jun-87	1	2.110	1.846	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	2.160	1.892	0.020	0.018	0.019
17-Jul-87	17-Jul-87	31	2.164	1.897	0.021	0.020	0.021
17-Aug-87	16-Aug-87	62	2.175	1.906	0.026	0.024	0.025
15-Sep-87	15-Sep-87	91	2.177	1.909	0.026	0.025	0.026
16-Oct-87	16-Oct-87	122	2.174	1.908	0.025	0.024	0.025
16-Dec-87	16-Dec-87	183	2.175	1.910	0.026	0.025	0.025
16-Mar-88	16-Mar-88	274	2.177	1.910	0.026	0.025	0.026
15-Jun-88	15-Jun-88	365	2.176	1.909	0.026	0.025	0.025
14-Dec-88	14-Dec-88	547	2.178	1.912	0.027	0.026	0.026
15-Jun-89	15-Jun-89	730	2.185	1.918	0.030	0.028	0.029

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
17-Jun-87	17-Jun-87	1	1.226	1.230	0.000	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	1.270	1.280	0.017	0.020	0.019	0.019
17-Jul-87	17-Jul-87	31	1.274	1.283	0.019	0.021	0.020	0.020
17-Aug-87	16-Aug-87	62	1.286	1.295	0.024	0.026	0.025	0.025
15-Sep-87	15-Sep-87	91	1.287	1.296	0.024	0.026	0.025	0.025
16-Oct-87	16-Oct-87	122	1.287	1.295	0.024	0.026	0.025	0.025
16-Dec-87	16-Dec-87	183	1.288	1.297	0.024	0.026	0.025	0.025
16-Mar-88	16-Mar-88	274	1.290	1.299	0.025	0.027	0.026	0.026
15-Jun-88	15-Jun-88	365	1.292	1.297	0.026	0.026	0.026	0.026
14-Dec-88	14-Dec-88	547	1.291	1.299	0.026	0.027	0.026	0.026
15-Jun-89	15-Jun-89	730	1.299	1.307	0.029	0.030	0.030	0.029

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S13 ASTM C227-87

Type: Natural Sand

Locality: Debley Pit

Dates Cast:

			Alk %	Temp C
2A,B	16-Jun-87	Tube T48	0.94	38
2C,D	17-Jun-87	Tube T49	0.94	38
4A,B	17-Jun-87	Tube T49	1.25	38
4C,D	17-Jun-87	Tube T49	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
17-Jun-87	17-Jun-87	1	2.050	2.140	0.000	0.000	0.000
30-Jun-87	30-Jun-87	14	2.066	2.163	0.006	0.009	0.008
17-Jul-87	17-Jul-87	31	2.063	2.158	0.005	0.007	0.006
17-Aug-87	16-Aug-87	62	2.072	2.166	0.009	0.010	0.009
15-Sep-87	15-Sep-87	91	2.071	2.166	0.008	0.010	0.009
16-Oct-87	16-Oct-87	122	2.069	2.163	0.007	0.009	0.008
16-Dec-87	16-Dec-87	183	2.071	2.163	0.008	0.009	0.009
16-Mar-88	16-Mar-88	274	2.070	2.165	0.008	0.010	0.009
15-Jun-88	15-Jun-88	365	2.068	2.162	0.007	0.009	0.008
14-Dec-88	14-Dec-88	547	2.071	2.166	0.008	0.010	0.009
15-Jun-89	15-Jun-89	730	2.079	2.173	0.011	0.013	0.012

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
18-Jun-87	18-Jun-87	1	1.930	1.995	0.000	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	1.946	2.011	0.006	0.006	0.006	0.007
17-Jul-87	18-Jul-87	30	1.949	2.012	0.007	0.007	0.007	0.007
18-Aug-87	17-Aug-87	62	1.948	2.015	0.007	0.008	0.007	0.008
16-Sep-87	16-Sep-87	91	1.949	2.016	0.007	0.008	0.008	0.009
16-Oct-87	17-Oct-87	121	1.945	2.012	0.006	0.007	0.006	0.007
17-Dec-87	17-Dec-87	183	1.943	2.009	0.005	0.006	0.005	0.007
17-Mar-88	17-Mar-88	274	1.941	2.010	0.004	0.006	0.005	0.007
16-Jun-88	16-Jun-88	365	1.945	2.010	0.006	0.006	0.006	0.007
15-Dec-88	15-Dec-88	547	1.943	2.007	0.005	0.005	0.005	0.007
16-Jun-89	16-Jun-89	730	1.951	2.017	0.008	0.009	0.008	0.010

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	S13	ASTM C227-87
Type:	Natural Sand	
Locality:	Debley Pit	

Dates Cast:

			Alk %	Temp C
2A,B	16-Jun-87	Tube T48	0.94	38
2C,D	17-Jun-87	Tube T49	0.94	38
4A,B	17-Jun-87	Tube T49	1.25	38
4C,D	17-Jun-87	Tube T49	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
18-Jun-87	18-Jun-87	1	1.734	1.749	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	1.766	1.774	0.013	0.010	0.011
17-Jul-87	18-Jul-87	30	1.768	1.773	0.013	0.009	0.011
18-Aug-87	17-Aug-87	62	1.774	1.783	0.016	0.013	0.015
16-Sep-87	16-Sep-87	91	1.775	1.783	0.016	0.013	0.015
16-Oct-87	17-Oct-87	121	1.770	1.780	0.014	0.012	0.013
17-Dec-87	17-Dec-87	183	1.768	1.775	0.013	0.010	0.012
17-Mar-88	17-Mar-88	274	1.770	1.781	0.014	0.013	0.013
16-Jun-88	16-Jun-88	365	1.769	1.779	0.014	0.012	0.013
15-Dec-88	15-Dec-88	547	1.768	1.779	0.013	0.012	0.013
16-Jun-89	16-Jun-89	730	1.776	1.784	0.017	0.014	0.015

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
18-Jun-87	18-Jun-87	1	0.900	0.809	0.000	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	0.929	0.837	0.011	0.011	0.011	0.011
17-Jul-87	18-Jul-87	30	0.927	0.836	0.011	0.011	0.011	0.011
18-Aug-87	17-Aug-87	62	0.935	0.843	0.014	0.013	0.014	0.014
16-Sep-87	16-Sep-87	91	0.936	0.844	0.014	0.014	0.014	0.014
16-Oct-87	17-Oct-87	121	0.934	0.842	0.013	0.013	0.013	0.013
17-Dec-87	17-Dec-87	183	0.930	0.839	0.012	0.012	0.012	0.012
17-Mar-88	17-Mar-88	274	0.929	0.839	0.011	0.012	0.012	0.012
16-Jun-88	16-Jun-88	365	0.931	0.839	0.012	0.012	0.012	0.012
15-Dec-88	15-Dec-88	547	0.930	0.838	0.012	0.011	0.012	0.012
16-Jun-89	16-Jun-89	730	0.937	0.845	0.015	0.014	0.014	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S14 ASTM C227-87

Type: Natural Sand

Locality: Seeley Pit

Dates Cast:

			Alk %	Temp C
2A,B	17-Jun-87	Tube T50	0.94	38
2C,D	18-Jun-87	Tube T52	0.94	38
4A,B	17-Jun-87	Tube T50	1.25	38
4C,D	17-Jun-87	Tube T51	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
18-Jun-87	18-Jun-87	1	2.345	2.241	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	2.367	2.263	0.009	0.009	0.009
17-Jul-87	18-Jul-87	30	2.366	2.261	0.008	0.008	0.008
18-Aug-87	17-Aug-87	62	2.371	2.267	0.010	0.010	0.010
16-Sep-87	16-Sep-87	91	2.370	2.267	0.010	0.010	0.010
16-Oct-87	17-Oct-87	121	2.367	2.264	0.009	0.009	0.009
17-Dec-87	17-Dec-87	183	2.365	2.262	0.008	0.008	0.008
17-Mar-88	17-Mar-88	274	2.374	2.261	0.011	0.008	0.010
16-Jun-88	16-Jun-88	365	2.370	2.266	0.010	0.010	0.010
15-Dec-88	15-Dec-88	547	2.375	2.270	0.012	0.011	0.012
16-Jun-89	16-Jun-89	730	2.385	2.282	0.016	0.016	0.016

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
19-Jun-87	19-Jun-87	1	1.016	0.857	0.000	0.000	0.000	0.000
02-Jul-87	02-Jul-87	14	1.023	0.864	0.003	0.003	0.003	0.006
20-Jul-87	19-Jul-87	32	1.028	0.868	0.005	0.004	0.005	0.006
18-Aug-87	18-Aug-87	61	1.032	0.871	0.006	0.006	0.006	0.008
17-Sep-87	17-Sep-87	91	1.027	0.867	0.004	0.004	0.004	0.007
19-Oct-87	18-Oct-87	123	1.027	0.869	0.004	0.005	0.005	0.007
18-Dec-87	18-Dec-87	183	1.026	0.866	0.004	0.004	0.004	0.006
18-Mar-88	18-Mar-88	274	1.027	0.869	0.004	0.005	0.005	0.007
17-Jun-88	17-Jun-88	365	1.030	0.872	0.006	0.006	0.006	0.008
16-Dec-88	16-Dec-88	547	1.030	0.872	0.006	0.006	0.006	0.009
16-Jun-89	17-Jun-89	729	1.039	0.884	0.009	0.011	0.010	0.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S14 ASTM C227-87

Type: Natural Sand

Locality: Seeley Pit

Dates Cast:

			Alk %	Temp C
2A,B	17-Jun-87	Tube T50	0.94	38
2C,D	18-Jun-87	Tube T52	0.94	38
4A,B	17-Jun-87	Tube T50	1.25	38
4C,D	17-Jun-87	Tube T51	1.25	38

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
18-Jun-87	18-Jun-87	1	1.156	1.446	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	1.181	1.479	0.010	0.013	0.011
17-Jul-87	18-Jul-87	30	1.181	1.478	0.010	0.013	0.011
18-Aug-87	17-Aug-87	62	1.188	1.488	0.013	0.017	0.015
16-Sep-87	16-Sep-87	91	1.186	1.488	0.012	0.017	0.014
16-Oct-87	17-Oct-87	121	1.182	1.483	0.010	0.015	0.012
17-Dec-87	17-Dec-87	183	1.178	1.481	0.009	0.014	0.011
17-Mar-88	17-Mar-88	274	1.179	1.479	0.009	0.013	0.011
16-Jun-88	16-Jun-88	365	1.184	1.483	0.011	0.015	0.013
15-Dec-88	15-Dec-88	547	1.186	1.486	0.012	0.016	0.014
16-Jun-89	16-Jun-89	730	1.196	1.495	0.016	0.019	0.018

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
18-Jun-87	18-Jun-87	1	2.809	2.479	0.000	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	2.827	2.501	0.007	0.009	0.008	0.010
17-Jul-87	18-Jul-87	30	2.827	2.500	0.007	0.008	0.008	0.009
18-Aug-87	17-Aug-87	62	2.836	2.506	0.011	0.011	0.011	0.013
16-Sep-87	16-Sep-87	91	2.835	2.507	0.010	0.011	0.011	0.012
16-Oct-87	17-Oct-87	121	2.832	2.503	0.009	0.009	0.009	0.011
17-Dec-87	17-Dec-87	183	2.832	2.503	0.009	0.009	0.009	0.010
17-Mar-88	17-Mar-88	274	2.829	2.501	0.008	0.009	0.008	0.010
16-Jun-88	16-Jun-88	365	2.833	2.506	0.009	0.011	0.010	0.011
15-Dec-88	15-Dec-88	547	2.837	2.508	0.011	0.011	0.011	0.013
16-Jun-89	16-Jun-89	730	2.845	2.518	0.014	0.015	0.015	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S15 ASTM C227-87

Type: Natural Sand

Locality: Mill Creek Pit

	Dates Cast:		Alk %	Temp C
2A,B	17-Jun-87	Tube T51	0.94	38
2C,D	17-Jun-87	Tube T51	0.94	38
4A,B	19-Jun-87	Tube T53	1.25	38
4C,D	18-Jun-87	Tube T52	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
18-Jun-87	18-Jun-87	1	1.921	2.108	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	1.945	2.131	0.009	0.009	0.009
17-Jul-87	18-Jul-87	30	1.951	2.134	0.012	0.010	0.011
18-Aug-87	17-Aug-87	62	1.955	2.142	0.013	0.013	0.013
16-Sep-87	16-Sep-87	91	1.954	2.139	0.013	0.012	0.013
16-Oct-87	17-Oct-87	121	1.951	2.137	0.012	0.011	0.012
17-Dec-87	17-Dec-87	183	1.951	2.137	0.012	0.011	0.012
17-Mar-88	17-Mar-88	274	1.950	2.136	0.011	0.011	0.011
16-Jun-88	16-Jun-88	365	1.955	2.140	0.013	0.013	0.013
15-Dec-88	15-Dec-88	547	1.954	2.137	0.013	0.011	0.012
16-Jun-89	16-Jun-89	730	1.962	2.145	0.016	0.015	0.015

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
18-Jun-87	18-Jun-87	1	1.136	1.222	0.000	0.000	0.000	0.000
02-Jul-87	01-Jul-87	15	1.156	1.246	0.008	0.009	0.009	0.009
17-Jul-87	18-Jul-87	30	1.159	1.252	0.009	0.012	0.010	0.011
18-Aug-87	17-Aug-87	62	1.166	1.255	0.012	0.013	0.012	0.013
16-Sep-87	16-Sep-87	91	1.164	1.253	0.011	0.012	0.012	0.012
16-Oct-87	17-Oct-87	121	1.161	1.252	0.010	0.012	0.011	0.011
17-Dec-87	17-Dec-87	183	1.159	1.250	0.009	0.011	0.010	0.011
17-Mar-88	17-Mar-88	274	1.157	1.248	0.008	0.010	0.009	0.010
16-Jun-88	16-Jun-88	365	1.166	1.254	0.012	0.013	0.012	0.013
15-Dec-88	15-Dec-88	547	1.164	1.253	0.011	0.012	0.012	0.012
16-Jun-89	16-Jun-89	730	1.170	1.260	0.013	0.015	0.014	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: S15 ASTM C227-87

Type: Natural Sand

Locality: Mill Creek Pit

Dates Cast:

			Alk %	Temp C
2A,B	17-Jun-87	Tube T51	0.94	38
2C,D	17-Jun-87	Tube T51	0.94	38
4A,B	19-Jun-87	Tube T53	1.25	38
4C,D	18-Jun-87	Tube T52	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
20-Jun-87	20-Jun-87	1	2.175	2.375	0.000	0.000	0.000
03-Jul-87	03-Jul-87	14	2.204	2.400	0.011	0.010	0.011
20-Jul-87	20-Jul-87	31	2.210	2.405	0.014	0.012	0.013
19-Aug-87	19-Aug-87	61	2.212	2.410	0.015	0.011	0.014
18-Sep-87	18-Sep-87	91	2.212	2.409	0.015	0.013	0.014
19-Oct-87	19-Oct-87	122	2.213	2.409	0.015	0.013	0.014
18-Dec-87	19-Dec-87	182	2.209	2.405	0.013	0.012	0.013
18-Mar-88	19-Mar-88	273	2.213	2.408	0.015	0.013	0.014
17-Jun-88	18-Jun-88	364	2.216	2.410	0.016	0.014	0.015
16-Dec-88	17-Dec-88	546	2.209	2.408	0.013	0.013	0.013
20-Jun-89	18-Jun-89	732	2.221	2.421	0.018	0.018	0.018

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
19-Jun-87	19-Jun-87	1	2.302	2.555	0.000	0.000	0.000	0.000
02-Jul-87	02-Jul-87	14	2.326	2.579	0.009	0.009	0.009	0.010
20-Jul-87	19-Jul-87	32	2.331	2.584	0.011	0.011	0.011	0.012
18-Aug-87	18-Aug-87	61	2.335	2.588	0.013	0.013	0.013	0.014
17-Sep-87	17-Sep-87	91	2.331	2.584	0.011	0.011	0.011	0.013
19-Oct-87	18-Oct-87	123	2.334	2.585	0.013	0.012	0.012	0.013
18-Dec-87	18-Dec-87	183	2.330	2.581	0.011	0.010	0.011	0.012
18-Mar-88	18-Mar-88	274	2.332	2.585	0.012	0.012	0.012	0.013
17-Jun-88	17-Jun-88	365	2.334	2.589	0.013	0.013	0.013	0.014
16-Dec-88	16-Dec-88	547	2.335	2.585	0.013	0.012	0.012	0.013
19-Jun-89	17-Jun-89	732	2.343	2.598	0.016	0.017	0.017	0.017

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CRS1 ASTM C227-87

Type: Control-Spratt Limestone

Locality: Spratt

	Dates Cast:		Alk %	Temp C	Sample Lengths:
2A,B	25-May-87	Tube T2	0.94	38	
2C,D	25-May-87	Tube T2	0.94	38	
4A,B	26-May-87	Tube T3	1.25	38	254.0 mm
4C,D	26-May-87	Tube T3	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
26-May-87	26-May-87	1	1.726	1.441	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	1.747	1.464	0.008	0.009	0.009
25-Jun-87	25-Jun-87	31	1.758	1.475	0.013	0.013	0.013
24-Jul-87	25-Jul-87	60	1.769	1.487	0.017	0.018	0.018
24-Aug-87	24-Aug-87	91	1.773	1.490	0.019	0.019	0.019
24-Sep-87	24-Sep-87	122	1.771	1.490	0.018	0.019	0.019
24-Nov-87	24-Nov-87	183	1.773	1.489	0.019	0.019	0.019
23-Feb-88	23-Feb-88	274	1.771	1.490	0.018	0.019	0.019
24-May-88	24-May-88	365	1.767	1.484	0.016	0.017	0.017
23-Nov-88	22-Nov-88	548	1.769	1.489	0.017	0.019	0.018
23-May-89	24-May-89	729	1.775	1.494	0.019	0.021	0.020

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
26-May-87	26-May-87	1	1.139	1.201	0.000	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	1.159	1.222	0.008	0.008	0.008	0.008
25-Jun-87	25-Jun-87	31	1.170	1.227	0.012	0.010	0.011	0.012
24-Jul-87	25-Jul-87	60	1.181	1.240	0.017	0.015	0.016	0.017
24-Aug-87	24-Aug-87	91	1.186	1.243	0.019	0.017	0.018	0.018
24-Sep-87	24-Sep-87	122	1.185	1.244	0.018	0.017	0.018	0.018
24-Nov-87	24-Nov-87	183	1.184	1.242	0.018	0.016	0.017	0.018
23-Feb-88	23-Feb-88	274	1.185	1.242	0.018	0.016	0.017	0.018
24-May-88	24-May-88	365	1.182	1.243	0.017	0.017	0.017	0.017
23-Nov-88	22-Nov-88	548	1.178	1.240	0.015	0.015	0.015	0.017
23-May-89	24-May-89	729	1.187	1.247	0.019	0.018	0.019	0.019

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CRS1 ASTM C227-87

Type: Control-Spratt Limestone

Locality: Spratt

Dates Cast:

			Alk %	Temp C	
2A,B	25-May-87	Tube T2	0.94	38	Sample Lengths:
2C,D	25-May-87	Tube T2	0.94	38	
4A,B	26-May-87	Tube T3	1.25	38	254.0 mm
4C,D	26-May-87	Tube T3	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
27-May-87	27-May-87	1	1.987	2.113	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	2.014	2.141	0.011	0.011	0.011
26-Jun-87	26-Jun-87	31	2.045	2.169	0.023	0.022	0.022
27-Jul-87	26-Jul-87	62	2.069	2.195	0.032	0.032	0.032
25-Aug-87	25-Aug-87	91	2.075	2.203	0.035	0.035	0.035
25-Sep-87	25-Sep-87	122	2.080	2.208	0.037	0.037	0.037
26-Nov-87	25-Nov-87	184	2.082	2.208	0.037	0.037	0.037
24-Feb-88	24-Feb-88	274	2.077	2.205	0.035	0.036	0.036
25-May-88	25-May-88	365	2.075	2.204	0.035	0.036	0.035
23-Nov-88	23-Nov-88	547	2.070	2.197	0.033	0.023	0.033
25-May-89	25-May-89	730	2.080	2.207	0.037	0.037	0.037

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
27-May-87	27-May-87	1	1.824	1.815	0.000	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	1.855	1.844	0.012	0.011	0.012	0.011
26-Jun-87	26-Jun-87	31	1.885	1.872	0.024	0.022	0.023	0.023
27-Jul-87	26-Jul-87	62	1.913	1.902	0.035	0.034	0.035	0.033
25-Aug-87	25-Aug-87	91	1.920	1.909	0.038	0.037	0.037	0.036
25-Sep-87	25-Sep-87	122	1.924	1.913	0.039	0.039	0.039	0.038
26-Nov-87	25-Nov-87	184	1.922	1.915	0.039	0.039	0.039	0.038
24-Feb-88	24-Feb-88	274	1.920	1.910	0.038	0.037	0.038	0.037
25-May-88	25-May-88	365	1.915	1.907	0.036	0.036	0.036	0.036
23-Nov-88	23-Nov-88	547	1.911	1.902	0.034	0.034	0.034	0.034
25-May-89	25-May-89	730	1.925	1.913	0.040	0.039	0.039	0.038

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CS2 ASTM C227-87

Type: Control-Sudbury Gravel

Locality: Sudbury

Dates Cast:

			Alk %	Temp C	Sample Lengths:
2A,B	26-May-87	Tube T3	0.94	38	
2C,D	26-May-87	Tube T4	0.94	38	
4A,B	27-May-87	Tube T8	1.25	38	254.0 mm
4C,D	26-May-87	Tube T4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
27-May-87	27-May-87	1	1.719	1.688	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	1.736	1.703	0.007	0.006	0.006
26-Jun-87	26-Jun-87	31	1.749	1.715	0.012	0.011	0.011
27-Jul-87	26-Jul-87	62	1.750	1.718	0.012	0.012	0.012
25-Aug-87	25-Aug-87	91	1.749	1.715	0.012	0.011	0.011
25-Sep-87	25-Sep-87	122	1.751	1.719	0.013	0.012	0.012
26-Nov-87	25-Nov-87	184	1.753	1.720	0.013	0.013	0.013
24-Feb-88	24-Feb-88	274	1.746	1.714	0.011	0.010	0.010
24-May-88	25-May-88	364	1.741	1.710	0.009	0.009	0.009
23-Nov-88	23-Nov-88	547	1.737	1.701	0.007	0.005	0.006
23-May-89	25-May-89	728	1.748	1.714	0.011	0.010	0.011

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
27-May-87	27-May-87	1	1.473	1.413	0.000	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	1.499	1.435	0.010	0.009	0.009	0.008
26-Jun-87	26-Jun-87	31	1.507	1.442	0.013	0.011	0.012	0.012
27-Jul-87	26-Jul-87	62	1.511	1.448	0.015	0.014	0.014	0.013
25-Aug-87	25-Aug-87	91	1.509	1.444	0.014	0.012	0.013	0.012
25-Sep-87	25-Sep-87	122	1.510	1.447	0.015	0.013	0.014	0.013
26-Nov-87	25-Nov-87	184	1.511	1.447	0.015	0.013	0.014	0.014
24-Feb-88	24-Feb-88	274	1.506	1.441	0.013	0.011	0.012	0.011
24-May-88	25-May-88	364	1.504	1.438	0.012	0.010	0.011	0.010
23-Nov-88	23-Nov-88	547	1.496	1.430	0.009	0.007	0.008	0.007
23-May-89	25-May-89	728	1.507	1.442	0.013	0.011	0.012	0.012

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CS2 ASTM C227-87

Type: Control-Sudbury Gravel

Locality: Sudbury

Dates Cast:

			Alk %	Temp C	Sample Lengths:
2A,B	26-May-87	Tube T3	0.94	38	
2C,D	26-May-87	Tube T4	0.94	38	
4A,B	27-May-87	Tube T3	1.25	38	254.0 mm
4C,D	26-May-87	Tube T4	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
28-May-87	28-May-87	1	1.853	1.888	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.878	1.910	0.010	0.009	0.009
26-Jun-87	27-Jun-87	30	1.887	1.921	0.013	0.013	0.013
27-Jul-87	27-Jul-87	61	1.893	1.927	0.016	0.015	0.016
26-Aug-87	26-Aug-87	91	1.890	1.924	0.015	0.014	0.014
30-Sep-87	26-Sep-87	126	1.892	1.927	0.015	0.015	0.015
27-Nov-87	26-Nov-87	184	1.895	1.930	0.017	0.017	0.017
25-Feb-88	25-Feb-88	274	1.888	1.923	0.014	0.014	0.014
26-May-88	26-May-88	365	1.882	1.916	0.011	0.011	0.011
24-Nov-88	24-Nov-88	547	1.881	1.916	0.011	0.011	0.011
26-May-89	26-May-89	730	1.892	1.928	0.015	0.016	0.016

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
27-May-87	27-May-87	1	1.804	1.902	0.000	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	1.829	1.930	0.010	0.011	0.010	0.010
26-Jun-87	26-Jun-87	31	1.839	1.939	0.014	0.015	0.014	0.014
27-Jul-87	26-Jul-87	62	1.844	1.943	0.016	0.016	0.016	0.016
25-Aug-87	25-Aug-87	91	1.842	1.941	0.015	0.015	0.015	0.015
25-Sep-87	25-Sep-87	122	1.845	1.943	0.016	0.016	0.016	0.016
26-Nov-87	25-Nov-87	184	1.846	1.943	0.017	0.016	0.016	0.016
24-Feb-88	24-Feb-88	274	1.839	1.938	0.014	0.014	0.014	0.014
25-May-88	25-May-88	365	1.837	1.934	0.013	0.013	0.013	0.012
23-Nov-88	23-Nov-88	547	1.832	1.924	0.011	0.009	0.010	0.010
25-May-89	25-May-89	730	1.843	1.939	0.015	0.015	0.015	0.015

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CRS3 ASTM C227-87

Type: Control-Nelson

Locality: Nelson

Dates Cast:			Alk %	Temp C
2A,B	26-May-87	Tube T5	0.94	38
2C,D	26-May-87	Tube T5	0.94	38
4A,B	27-May-87	Tube T6	1.25	38
4C,D	27-May-87	Tube T6	1.25	38

Sample
Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
27-May-87	27-May-87	1	0.888	0.828	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	0.910	0.850	0.009	0.009	0.009
26-Jun-87	26-Jun-87	31	0.925	0.864	0.015	0.014	0.014
27-Jul-87	26-Jul-87	62	0.930	0.867	0.017	0.015	0.016
25-Aug-87	25-Aug-87	91	0.932	0.868	0.017	0.016	0.017
25-Sep-87	25-Sep-87	122	0.933	0.870	0.018	0.017	0.017
26-Nov-87	25-Nov-87	184	0.939	0.875	0.020	0.019	0.019
24-Feb-88	24-Feb-88	274	0.936	0.872	0.019	0.017	0.018
25-May-88	25-May-88	365	0.933	0.869	0.018	0.016	0.017
23-Nov-88	23-Nov-88	547	0.933	0.867	0.018	0.015	0.017
25-May-89	25-May-89	730	0.945	0.880	0.022	0.020	0.021

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
27-May-87	27-May-87	1	2.038	1.624	0.000	0.000	0.000	0.000
09-Jun-87	09-Jun-87	14	2.061	1.645	0.009	0.008	0.009	0.009
26-Jun-87	26-Jun-87	31	2.076	1.659	0.015	0.014	0.014	0.014
27-Jul-87	26-Jul-87	62	2.080	1.663	0.017	0.015	0.016	0.016
25-Aug-87	25-Aug-87	91	2.081	1.665	0.017	0.016	0.017	0.017
25-Sep-87	25-Sep-87	122	2.083	1.667	0.018	0.017	0.017	0.017
26-Nov-87	25-Nov-87	184	2.089	1.671	0.020	0.019	0.019	0.019
24-Feb-88	24-Feb-88	274	2.086	1.669	0.019	0.018	0.018	0.018
25-May-88	25-May-88	365	2.083	1.664	0.018	0.016	0.017	0.017
23-Nov-88	23-Nov-88	547	2.088	1.671	0.020	0.019	0.019	0.018
25-May-89	25-May-89	730	2.095	1.678	0.022	0.021	0.022	0.022

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample:	CRS3	ASTM C227-87
Type:	Control-Nelson	
Locality:	Nelson	

Dates Cast:

			Alk %	Temp C	
2A,B	26-May-87	Tube T5	0.94	38	Sample Lengths:
2C,D	26-May-87	Tube T5	0.94	38	
4A,B	27-May-87	Tube T6	1.25	38	254.0 mm
4C,D	27-May-87	Tube T6	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
28-May-87	28-May-87	1	1.138	1.176	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.170	1.206	0.013	0.012	0.012
26-Jun-87	27-Jun-87	30	1.177	1.213	0.015	0.015	0.015
27-Jul-87	27-Jul-87	61	1.185	1.223	0.019	0.019	0.019
26-Aug-87	26-Aug-87	91	1.188	1.227	0.020	0.020	0.020
25-Sep-87	26-Sep-87	121	1.190	1.235	0.020	0.023	0.022
26-Nov-87	26-Nov-87	183	1.195	1.234	0.022	0.023	0.023
25-Feb-88	25-Feb-88	274	1.194	1.232	0.022	0.022	0.022
26-May-88	26-May-88	365	1.193	1.229	0.022	0.021	0.021
24-Nov-88	24-Nov-88	547	1.191	1.222	0.021	0.018	0.019
26-May-89	26-May-89	730	1.207	1.241	0.027	0.026	0.026

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
28-May-87	28-May-87	1	1.798	1.941	0.000	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.827	1.969	0.011	0.011	0.011	0.012
26-Jun-87	27-Jun-87	30	1.833	1.979	0.014	0.015	0.014	0.015
27-Jul-87	27-Jul-87	61	1.842	1.986	0.017	0.018	0.018	0.018
26-Aug-87	26-Aug-87	91	1.845	1.989	0.019	0.019	0.019	0.019
25-Sep-87	26-Sep-87	121	1.847	1.989	0.019	0.019	0.019	0.020
26-Nov-87	26-Nov-87	183	1.853	1.999	0.022	0.023	0.022	0.022
25-Feb-88	25-Feb-88	274	1.852	1.994	0.021	0.021	0.021	0.022
26-May-88	26-May-88	365	1.848	1.990	0.020	0.019	0.019	0.020
24-Nov-88	24-Nov-88	547	1.851	1.993	0.021	0.020	0.021	0.020
26-May-89	26-May-89	730	1.858	2.004	0.024	0.025	0.024	0.025

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CRS4 ASTM C227-87

Type: Control-Pittsburgh Limestone

Locality: Pittsburgh

Dates Cast:

			Alk %	Temp C
2A,B	27-May-87	Tube T6	0.94	38
2C,D	27-May-87	Tube T7	0.94	38
4A,B	27-May-87	Tube T7	1.25	38
4C,D	27-May-87	Tube T7	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
28-May-87	28-May-87	1	2.097	2.121	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	2.143	2.168	0.018	0.019	0.018
26-Jun-87	27-Jun-87	30	2.161	2.182	0.025	0.024	0.025
27-Jul-87	27-Jul-87	61	2.179	2.199	0.032	0.031	0.031
26-Aug-87	26-Aug-87	91	2.188	2.208	0.036	0.034	0.035
25-Sep-87	26-Sep-87	121	2.190	2.209	0.037	0.035	0.036
26-Nov-87	26-Nov-87	133	2.197	2.215	0.039	0.037	0.038
25-Feb-88	25-Feb-88	274	2.197	2.218	0.039	0.038	0.039
26-May-88	26-May-88	365	2.198	2.218	0.040	0.038	0.039
24-Nov-88	24-Nov-88	547	2.201	2.222	0.041	0.040	0.040
26-May-89	26-May-89	730	2.211	2.232	0.045	0.044	0.044

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
28-May-87	28-May-87	1	1.756	1.693	0.000	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.808	1.742	0.020	0.019	0.020	0.019
26-Jun-87	27-Jun-87	30	1.828	1.760	0.028	0.026	0.027	0.026
27-Jul-87	27-Jul-87	61	1.843	1.779	0.034	0.034	0.034	0.033
26-Aug-87	26-Aug-87	91	1.850	1.785	0.037	0.036	0.037	0.036
25-Sep-87	26-Sep-87	121	1.855	1.789	0.039	0.038	0.038	0.037
26-Nov-87	26-Nov-87	183	1.864	1.796	0.043	0.041	0.042	0.040
25-Feb-88	25-Feb-88	274	1.865	1.798	0.043	0.041	0.042	0.040
26-May-88	26-May-88	365	1.865	1.801	0.043	0.043	0.043	0.041
24-Nov-88	24-Nov-88	547	1.867	1.800	0.044	0.042	0.043	0.042
26-May-89	26-May-89	730	1.880	1.817	0.049	0.049	0.049	0.047

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CRS4 ASTM C227-87

Type: Control-Pittsburgh Limestone

Locality: Pittsburgh

Dates Cast:

			Alk %	Temp C
2A,B	27-May-87	Tube T6	0.94	38
2C,D	27-May-87	Tube T7	0.94	38
4A,B	27-May-87	Tube T7	1.25	38
4C,D	27-May-87	Tube T7	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
28-May-87	28-May-87	1	1.349	1.495	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.402	1.549	0.021	0.021	0.021
26-Jun-87	27-Jun-87	30	1.423	1.572	0.029	0.030	0.030
27-Jul-87	27-Jul-87	61	1.446	1.593	0.038	0.039	0.038
26-Aug-87	26-Aug-87	91	1.455	1.602	0.042	0.042	0.042
25-Sep-87	26-Sep-87	121	1.460	1.607	0.044	0.044	0.044
26-Nov-87	26-Nov-87	183	1.468	1.616	0.047	0.048	0.047
25-Feb-88	25-Feb-88	274	1.468	1.616	0.047	0.048	0.047
26-May-88	26-May-88	365	1.470	1.621	0.048	0.050	0.049
24-Nov-88	24-Nov-88	547	1.474	1.624	0.049	0.051	0.050
26-May-89	26-May-89	730	1.484	1.633	0.053	0.054	0.054

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
28-May-87	28-May-87	1	1.621	1.792	0.000	0.000	0.000	0.000
10-Jun-87	10-Jun-87	14	1.678	1.849	0.022	0.022	0.022	0.022
26-Jun-87	27-Jun-87	30	1.702	1.871	0.032	0.031	0.031	0.031
27-Jul-87	27-Jul-87	61	1.728	1.892	0.042	0.039	0.041	0.040
26-Aug-87	26-Aug-87	91	1.737	1.900	0.046	0.043	0.044	0.043
25-Sep-87	26-Sep-87	121	1.742	1.907	0.048	0.045	0.046	0.045
26-Nov-87	26-Nov-87	183	1.753	1.917	0.052	0.049	0.051	0.049
25-Feb-88	25-Feb-88	274	1.753	1.920	0.052	0.050	0.051	0.049
26-May-88	26-May-88	365	1.753	1.918	0.052	0.050	0.051	0.050
24-Nov-88	24-Nov-88	547	1.758	1.926	0.054	0.053	0.053	0.052
26-May-89	26-May-89	730	1.764	1.939	0.056	0.058	0.057	0.055

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CS5 ASTM C227-87

Type: Control-Guelph Sand

Locality: Guelph

Dates Cast:			Alk %	Temp C
2A,B	25-May-87	Tube T1	0.94	38
2C,D	25-May-87	Tube T1	0.94	38
4A,B	25-May-87	Tube T1	1.25	38
4C,D	25-May-87	Tube T2	1.25	38

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading 2A	Reading 2B	% Elong. 2A	% Elong. 2B	% Elong. 2AB MEAN
26-May-87	26-May-87	1	1.761	1.734	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	1.784	1.752	0.009	0.007	0.008
25-Jun-87	25-Jun-87	31	1.790	1.762	0.011	0.011	0.011
24-Jul-87	25-Jul-87	60	1.801	1.772	0.016	0.015	0.015
24-Aug-87	24-Aug-87	91	1.802	1.773	0.016	0.015	0.016
24-Sep-87	24-Sep-87	122	1.802	1.772	0.016	0.015	0.016
24-Nov-87	24-Nov-87	183	1.800	1.772	0.015	0.015	0.015
23-Feb-88	23-Feb-88	274	1.801	1.771	0.016	0.015	0.015
24-May-88	24-May-88	365	1.801	1.769	0.016	0.014	0.015
23-Nov-88	22-Nov-88	548	1.807	1.777	0.018	0.017	0.018
23-May-89	24-May-89	729	1.807	1.778	0.018	0.017	0.018

Actual Date	Optimum Date	Actual Age	Reading 2C	Reading 2D	% Elong. 2C	% Elong. 2D	% Elong. 2CD MEAN	% Elong. 2 MEAN
26-May-87	26-May-87	1	1.975	1.880	0.000	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	1.989	1.897	0.006	0.007	0.006	0.007
25-Jun-87	25-Jun-87	31	2.000	1.904	0.010	0.009	0.010	0.010
24-Jul-87	25-Jul-87	60	2.010	1.913	0.014	0.013	0.013	0.014
24-Aug-87	24-Aug-87	91	2.012	1.914	0.015	0.013	0.014	0.015
24-Sep-87	24-Sep-87	122	2.010	1.912	0.014	0.013	0.013	0.014
24-Nov-87	24-Nov-87	183	2.007	1.911	0.013	0.012	0.012	0.014
23-Feb-88	23-Feb-88	274	2.009	1.911	0.013	0.012	0.013	0.014
24-May-88	24-May-88	365	2.006	1.901	0.012	0.008	0.010	0.012
23-Nov-88	22-Nov-88	548	2.006	1.908	0.012	0.011	0.012	0.015
23-May-89	24-May-89	729	2.014	1.918	0.015	0.015	0.015	0.016

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST RESULTS

Sample: CS5 ASTM C227-87

Type: Control-Guelph Sand

Locality: Guelph

Dates Cast:			Alk %	Temp C	Sample Lengths:
2A,B	25-May-87	Tube T1	0.94	38	
2C,D	25-May-87	Tube T1	0.94	38	
4A,B	25-May-87	Tube T1	1.25	38	254.0 mm
4C,D	25-May-87	Tube T2	1.25	38	

Actual Date	Optimum Date	Actual Age	Reading 4A	Reading 4B	% Elong. 4A	% Elong. 4B	% Elong. 4AB MEAN
26-May-87	26-May-87	1	1.234	1.813	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	1.259	1.843	0.010	0.012	0.011
25-Jun-87	25-Jun-87	31	1.268	1.852	0.013	0.015	0.014
24-Jul-87	25-Jul-87	60	1.278	1.863	0.017	0.020	0.019
24-Aug-87	24-Aug-87	91	1.280	1.866	0.018	0.021	0.019
24-Sep-87	24-Sep-87	122	1.281	1.866	0.019	0.021	0.020
24-Nov-87	24-Nov-87	183	1.279	1.865	0.018	0.020	0.019
23-Feb-88	23-Feb-88	274	1.279	1.866	0.018	0.021	0.019
24-May-88	24-May-88	365	1.274	1.862	0.016	0.019	0.018
23-Nov-88	22-Nov-88	548	1.276	1.862	0.017	0.019	0.018
23-May-89	24-May-89	729	1.286	1.872	0.020	0.023	0.022

Actual Date	Optimum Date	Actual Age	Reading 4C	Reading 4D	% Elong. 4C	% Elong. 4D	% Elong. 4CD MEAN	% Elong. 4 MEAN
26-May-87	26-May-87	1	0.856	0.883	0.000	0.000	0.000	0.000
08-Jun-87	08-Jun-87	14	0.886	0.913	0.012	0.012	0.012	0.011
25-Jun-87	25-Jun-87	31	0.895	0.921	0.015	0.015	0.015	0.015
24-Jul-87	25-Jul-87	60	0.905	0.932	0.019	0.019	0.019	0.019
24-Aug-87	24-Aug-87	91	0.908	0.936	0.020	0.021	0.021	0.020
24-Sep-87	24-Sep-87	122	0.910	0.939	0.021	0.022	0.022	0.021
24-Nov-87	24-Nov-87	183	0.909	0.937	0.021	0.021	0.021	0.020
23-Feb-88	23-Feb-88	274	0.909	0.938	0.021	0.022	0.021	0.020
24-May-88	24-May-88	365	0.907	0.935	0.020	0.020	0.020	0.019
23-Nov-88	22-Nov-88	548	0.907	0.935	0.020	0.020	0.020	0.019
23-May-89	24-May-89	729	0.914	0.943	0.023	0.024	0.023	0.023

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR1 Oberholster Method

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:		Alk %	Temp C	Sample Lengths:
A,B	08-Aug-88	0.92	80	
C,D	08-Aug-88	0.92	80	
				254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
10-Aug-88	10-Aug-88	2	1.187	1.171	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	1.194	1.162	0.003	-0.004	.000
12-Aug-88	12-Aug-88	4	1.210	1.181	0.009	0.004	0.006
15-Aug-88	15-Aug-88	7	1.553	1.518	0.144	0.137	0.140
16-Aug-88	16-Aug-88	8	1.734	1.706	0.215	0.211	0.213
17-Aug-88	17-Aug-88	9	1.838	1.806	0.256	0.250	0.253
18-Aug-88	18-Aug-88	10	2.014	1.984	0.326	0.320	0.323
19-Aug-88	19-Aug-88	11	2.097	2.071	0.358	0.354	0.356
22-Aug-88	22-Aug-88	14	2.393	2.368	0.475	0.471	0.473
23-Aug-88	23-Aug-88	15	2.410	2.387	0.481	0.479	0.480
24-Aug-88	24-Aug-88	16	2.478	2.462	0.508	0.508	0.508
25-Aug-88	25-Aug-88	17	2.495	2.477	0.515	0.514	0.515
26-Aug-88	26-Aug-88	18	2.567	2.548	0.543	0.542	0.543
29-Aug-88	29-Aug-88	21	2.648	2.638	0.575	0.578	0.576
30-Aug-88	30-Aug-88	22	2.722	2.688	0.604	0.597	0.601
31-Aug-88	31-Aug-88	23	2.716	2.704	0.602	0.604	0.603
17-Oct-88	17-Oct-88	70	4.067	4.050	1.134	1.133	1.134

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR1 Oberholster Method

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Springhill

Dates Cast:

		Alk %	Temp C
A,B	08-Aug-88	0.92	80
C,D	08-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
10-Aug-88	10-Aug-88	2	1.922	1.830	0.000	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	1.911	1.824	-0.004	-0.002	-0.003	-0.002
12-Aug-88	12-Aug-88	4	1.938	1.859	0.006	0.011	0.009	0.008
15-Aug-88	15-Aug-88	7	2.250	2.175	0.129	0.136	0.132	0.136
16-Aug-88	16-Aug-88	8	2.443	2.369	0.205	0.212	0.209	0.211
17-Aug-88	17-Aug-88	9	2.548	2.483	0.246	0.257	0.252	0.252
18-Aug-88	18-Aug-88	10	2.705	2.633	0.308	0.316	0.312	0.318
19-Aug-88	19-Aug-88	11	2.801	2.729	0.346	0.354	0.350	0.353
22-Aug-88	22-Aug-88	14	3.089	3.011	0.459	0.465	0.462	0.468
23-Aug-88	23-Aug-88	15	3.108	3.029	0.467	0.472	0.469	0.475
24-Aug-88	24-Aug-88	16	3.192	3.114	0.500	0.506	0.503	0.506
25-Aug-88	25-Aug-88	17	3.207	3.112	0.506	0.505	0.505	0.510
26-Aug-88	26-Aug-88	18	3.262	3.190	0.528	0.535	0.531	0.537
29-Aug-88	29-Aug-88	21	3.353	3.284	0.563	0.572	0.568	0.572
30-Aug-88	30-Aug-88	22	3.415	3.340	0.588	0.594	0.591	0.596
31-Aug-88	31-Aug-88	23	3.421	3.354	0.590	0.600	0.595	0.599
17-Oct-88	17-Oct-88	70	4.742	4.694	1.110	1.128	1.119	1.126

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR2 Oberholster Method

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths: 254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
12-Aug-88	12-Aug-88	2	2.211	2.346	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.237	2.391	0.010	0.018	0.014
16-Aug-88	16-Aug-88	6	2.265	2.408	0.021	0.024	0.023
17-Aug-88	17-Aug-88	7	2.340	2.487	0.051	0.056	0.053
18-Aug-88	18-Aug-88	8	2.416	2.574	0.081	0.090	0.085
19-Aug-88	19-Aug-88	9	2.569	2.727	0.141	0.150	0.145
22-Aug-88	22-Aug-88	12	2.898	3.069	0.270	0.285	0.278
23-Aug-88	23-Aug-88	13	2.986	3.155	0.305	0.319	0.312
24-Aug-88	24-Aug-88	14	3.018	3.192	0.318	0.333	0.325
25-Aug-88	25-Aug-88	15	3.095	3.267	0.348	0.363	0.355
26-Aug-88	26-Aug-88	16	3.136	3.316	0.364	0.382	0.373
29-Aug-88	29-Aug-88	19	3.309	3.493	0.432	0.452	0.442
30-Aug-88	30-Aug-88	20	3.329	3.517	0.440	0.461	0.451
31-Aug-88	31-Aug-88	21	3.398	3.583	0.467	0.487	0.477
01-Sep-88	01-Sep-88	22	3.432	3.618	0.481	0.501	0.491
17-Oct-88	17-Oct-88	68	4.578	4.775	0.932	0.956	0.944

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR2 Oberholster Method

Rock Type: Slate, Meta-argillite (Mudstone)

Locality: Kedgwick

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
12-Aug-88	12-Aug-88	2	2.542	2.592	0.000	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.570	2.628	0.011	0.014	0.013	0.013
16-Aug-88	16-Aug-88	6	2.596	2.644	0.021	0.020	0.021	0.022
17-Aug-88	17-Aug-88	7	2.683	2.741	0.056	0.059	0.057	0.055
18-Aug-88	18-Aug-88	8	2.765	2.818	0.088	0.089	0.088	0.087
19-Aug-88	19-Aug-88	9	2.930	2.995	0.153	0.159	0.156	0.151
22-Aug-88	22-Aug-88	12	3.223	3.328	0.268	0.290	0.279	0.278
23-Aug-88	23-Aug-88	13	3.333	3.420	0.311	0.326	0.319	0.315
24-Aug-88	24-Aug-88	14	3.398	3.470	0.337	0.346	0.341	0.333
25-Aug-88	25-Aug-88	15	3.471	3.537	0.366	0.372	0.369	0.362
26-Aug-88	26-Aug-88	16	3.522	3.592	0.386	0.394	0.390	0.381
29-Aug-88	29-Aug-88	19	3.678	3.762	0.447	0.461	0.454	0.448
30-Aug-88	30-Aug-88	20	3.725	3.799	0.466	0.475	0.470	0.461
31-Aug-88	31-Aug-88	21	3.781	3.858	0.488	0.498	0.493	0.485
01-Sep-88	01-Sep-88	22	3.824	3.890	0.505	0.511	0.508	0.499
17-Oct-88	17-Oct-88	68	4.962	5.010	0.953	0.952	0.952	0.948

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR3 Oberholster Method

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Nicholas Denys

Dates Cast:

		Alk %	Temp C
A,B	08-Aug-88	0.92	80
C,D	08-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
10-Aug-88	10-Aug-88	2	2.152	2.270	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	2.151	2.271	.000	.000	.000
12-Aug-88	12-Aug-88	4	2.187	2.308	0.014	0.015	0.014
15-Aug-88	15-Aug-88	7	2.315	2.445	0.064	0.069	0.067
16-Aug-88	16-Aug-88	8	2.459	2.596	0.121	0.128	0.125
17-Aug-88	17-Aug-88	9	2.574	2.718	0.166	0.176	0.171
18-Aug-88	18-Aug-88	10	2.726	2.868	0.226	0.235	0.231
19-Aug-88	19-Aug-88	11	2.798	2.940	0.254	0.264	0.259
22-Aug-88	22-Aug-88	14	3.140	3.259	0.389	0.389	0.389
23-Aug-88	23-Aug-88	15	3.167	3.296	0.400	0.404	0.402
24-Aug-88	24-Aug-88	16	3.273	3.388	0.441	0.440	0.441
25-Aug-88	25-Aug-88	17	3.306	3.425	0.454	0.455	0.455
26-Aug-88	26-Aug-88	18	3.378	3.505	0.483	0.486	0.484
29-Aug-88	29-Aug-88	21	3.539	3.646	0.546	0.542	0.544
30-Aug-88	30-Aug-88	22	3.620	3.724	0.578	0.572	0.575
31-Aug-88	31-Aug-88	23	3.627	3.727	0.581	0.574	0.577
17-Oct-88	17-Oct-88	70	4.763	4.805	1.028	0.998	1.013

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample:	OR3	Oberholster Method		
Rock Type:	Slate, Meta-argillite (Siltstone)			
Locality:	Nicholas Denys			
Dates Cast:		Alk %	Temp C	Sample Lengths:
A,B	08-Aug-88	0.92	80	
C,D	08-Aug-88	0.92	80	
				254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
10-Aug-88	10-Aug-88	2	1.878	1.851	0.000	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	1.879	1.849	.000	-0.001	.000	.000
12-Aug-88	12-Aug-88	4	1.906	1.875	0.011	0.009	0.010	0.012
15-Aug-88	15-Aug-88	7	2.058	2.019	0.071	0.066	0.069	0.068
16-Aug-88	16-Aug-88	8	2.200	2.151	0.127	0.118	0.122	0.124
17-Aug-88	17-Aug-88	9	2.323	2.271	0.175	0.165	0.170	0.171
18-Aug-88	18-Aug-88	10	2.469	2.410	0.233	0.220	0.226	0.229
19-Aug-88	19-Aug-88	11	2.537	2.479	0.259	0.247	0.253	0.256
22-Aug-88	22-Aug-88	14	2.844	2.777	0.380	0.365	0.372	0.381
23-Aug-88	23-Aug-88	15	2.884	2.825	0.396	0.383	0.390	0.396
24-Aug-88	24-Aug-88	16	2.973	2.891	0.431	0.409	0.420	0.431
25-Aug-88	25-Aug-88	17	3.011	2.942	0.446	0.430	0.438	0.446
26-Aug-88	26-Aug-88	18	3.095	3.030	0.479	0.464	0.472	0.478
29-Aug-88	29-Aug-88	21	3.225	3.149	0.530	0.511	0.521	0.532
30-Aug-88	30-Aug-88	22	3.309	3.239	0.563	0.546	0.555	0.565
31-Aug-88	31-Aug-88	23	3.319	3.239	0.567	0.546	0.557	0.567
17-Oct-88	17-Oct-88	70	4.416	4.237	0.999	0.939	0.969	0.991

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR4 Oberholster Method

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

	Dates Cast:	Alk %	Temp C	Sample Lengths:
A,B	10-Aug-88	0.92	80	
C,D	10-Aug-88	0.92	80	254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
12-Aug-88	12-Aug-88	2	2.466	2.480	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.537	2.551	0.028	0.028	0.028
16-Aug-88	16-Aug-88	6	2.667	2.682	0.079	0.080	0.079
17-Aug-88	17-Aug-88	7	2.835	2.855	0.145	0.148	0.146
18-Aug-88	18-Aug-88	8	3.058	3.068	0.233	0.231	0.232
19-Aug-88	19-Aug-88	9	3.159	3.170	0.273	0.272	0.272
22-Aug-88	22-Aug-88	12	3.470	3.504	0.395	0.403	0.399
23-Aug-88	23-Aug-88	13	3.528	3.550	0.418	0.421	0.420
24-Aug-88	24-Aug-88	14	3.636	3.654	0.461	0.462	0.461
25-Aug-88	25-Aug-88	15	3.658	3.672	0.469	0.469	0.469
26-Aug-88	26-Aug-88	16	3.764	3.778	0.511	0.511	0.511
29-Aug-88	29-Aug-88	19	3.914	3.940	0.570	0.575	0.572
30-Aug-88	30-Aug-88	20	4.009	4.032	0.607	0.611	0.609
31-Aug-88	31-Aug-88	21	4.022	4.053	0.613	0.619	0.616
01-Sep-88	01-Sep-88	22	4.125	4.132	0.653	0.650	0.652
17-Oct-88	17-Oct-88	68	5.440	5.500	1.171	1.189	1.180

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR4 Oberholster Method

Rock Type: Slate, Meta-argillite (Siltstone)

Locality: Meductic

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
12-Aug-88	12-Aug-88	2	2.300	2.482	0.000	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.378	2.554	0.031	0.028	0.030	0.029
16-Aug-88	16-Aug-88	6	2.495	2.658	0.073	0.069	0.071	0.075
17-Aug-88	17-Aug-88	7	2.662	2.847	0.143	0.144	0.143	0.145
18-Aug-88	18-Aug-88	8	2.861	3.039	0.221	0.219	0.220	0.226
19-Aug-88	19-Aug-88	9	2.958	3.144	0.259	0.261	0.260	0.266
22-Aug-88	22-Aug-88	12	3.283	3.482	0.387	0.394	0.390	0.395
23-Aug-88	23-Aug-88	13	3.322	3.514	0.402	0.406	0.404	0.412
24-Aug-88	24-Aug-88	14	3.402	3.600	0.434	0.440	0.437	0.449
25-Aug-88	25-Aug-88	15	3.455	3.655	0.455	0.462	0.458	0.464
26-Aug-88	26-Aug-88	16	3.551	3.736	0.493	0.494	0.493	0.502
29-Aug-88	29-Aug-88	19	3.705	3.909	0.553	0.562	0.557	0.565
30-Aug-88	30-Aug-88	20	3.788	3.989	0.586	0.593	0.590	0.599
31-Aug-88	31-Aug-88	21	3.815	4.018	0.596	0.605	0.601	0.608
01-Sep-88	01-Sep-88	22	3.883	4.087	0.623	0.632	0.628	0.640
17-Oct-88	17-Oct-88	68	5.146	5.346	1.120	1.128	1.124	1.152

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR5 Oberholster Method

Rock Type: Schist

Locality: Saint John

Dates Cast:

		Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
11-Aug-88	11-Aug-88	2	1.537	1.513	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.555	1.514	0.007	.000	0.004
15-Aug-88	15-Aug-88	6	1.668	1.622	0.052	0.043	0.047
16-Aug-88	16-Aug-88	7	1.736	1.689	0.078	0.069	0.074
17-Aug-88	17-Aug-88	8	1.815	1.769	0.109	0.101	0.105
18-Aug-88	18-Aug-88	9	1.864	1.815	0.129	0.119	0.124
19-Aug-88	19-Aug-88	10	1.939	1.907	0.158	0.155	0.157
22-Aug-88	22-Aug-88	13	2.157	2.101	0.244	0.231	0.238
23-Aug-88	23-Aug-88	14	2.254	2.203	0.282	0.272	0.277
24-Aug-88	24-Aug-88	15	2.279	2.225	0.292	0.280	0.286
25-Aug-88	25-Aug-88	16	2.353	2.302	0.321	0.311	0.316
26-Aug-88	26-Aug-88	17	2.376	2.315	0.330	0.316	0.323
29-Aug-88	29-Aug-88	20	2.503	2.441	0.380	0.365	0.373
30-Aug-88	30-Aug-88	21	2.586	2.521	0.413	0.397	0.405
31-Aug-88	31-Aug-88	22	2.607	2.539	0.421	0.404	0.413
01-Sep-88	01-Sep-88	23	2.683	2.607	0.451	0.431	0.441
17-Oct-88	17-Oct-88	69	3.508	3.394	0.776	0.741	0.758

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR5 Oberholster Method

Rock Type: Schist

Locality: Saint John

Dates Cast:

		Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
11-Aug-88	11-Aug-88	2	2.371	2.238	0.000	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	2.377	2.240	0.002	0.001	0.002	0.003
15-Aug-88	15-Aug-88	6	2.480	2.351	0.043	0.044	0.044	0.045
16-Aug-88	16-Aug-88	7	2.552	2.419	0.071	0.071	0.071	0.073
17-Aug-88	17-Aug-88	8	2.633	2.512	0.103	0.108	0.106	0.105
18-Aug-88	18-Aug-88	9	2.670	2.555	0.118	0.125	0.121	0.123
19-Aug-88	19-Aug-88	10	2.760	2.653	0.153	0.163	0.158	0.157
22-Aug-88	22-Aug-88	13	2.941	2.845	0.224	0.239	0.232	0.235
23-Aug-88	23-Aug-88	14	3.049	2.956	0.267	0.283	0.275	0.276
24-Aug-88	24-Aug-88	15	3.059	2.968	0.271	0.287	0.279	0.283
25-Aug-88	25-Aug-88	16	3.148	3.053	0.306	0.323	0.314	0.315
26-Aug-88	26-Aug-88	17	3.148	3.059	0.306	0.323	0.315	0.319
29-Aug-88	29-Aug-88	20	3.268	3.183	0.353	0.372	0.363	0.368
30-Aug-88	30-Aug-88	21	3.355	3.281	0.387	0.411	0.399	0.402
31-Aug-88	31-Aug-88	22	3.368	3.282	0.393	0.411	0.402	0.407
01-Sep-88	01-Sep-88	23	3.436	3.350	0.419	0.438	0.429	0.435
17-Oct-88	17-Oct-88	69	4.220	4.177	0.728	0.763	0.746	0.752

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR7 Oberholster Method

Rock Type: Meta-greywacke

Locality: St. Francois-de-M

Dates Cast:		Alk %	Temp C
A,B	08-Aug-88	0.92	80
C,D	08-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
10-Aug-88	10-Aug-88	2	3.128	2.985	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	3.127	2.968	.000	-0.007	-0.004
12-Aug-88	12-Aug-88	4	3.206	3.052	0.031	0.026	0.029
15-Aug-88	15-Aug-88	7	3.674	3.544	0.215	0.220	0.218
16-Aug-88	16-Aug-88	8	3.815	3.682	0.270	0.274	0.272
17-Aug-88	17-Aug-88	9	3.906	3.789	0.306	0.317	0.311
18-Aug-88	18-Aug-88	10	4.004	3.887	0.345	0.355	0.350
19-Aug-88	19-Aug-88	11	4.065	3.958	0.369	0.383	0.376
22-Aug-88	22-Aug-88	14	4.312	4.219	0.466	0.486	0.476
23-Aug-88	23-Aug-88	15	4.370	4.286	0.489	0.512	0.501
24-Aug-88	24-Aug-88	16	4.443	4.354	0.518	0.539	0.528
25-Aug-88	25-Aug-88	17	4.495	4.419	0.538	0.565	0.551
26-Aug-88	26-Aug-88	18	4.562	4.474	0.565	0.586	0.575
29-Aug-88	29-Aug-88	21	4.716	4.659	0.625	0.659	0.642
30-Aug-88	30-Aug-88	22	4.783	4.721	0.652	0.683	0.668
31-Aug-88	31-Aug-88	23	4.803	4.754	0.659	0.696	0.678
17-Oct-88	17-Oct-88	70	5.837	5.832	1.067	1.121	1.094

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR7 Oberholster Method

Rock Type: Meta-greywacke

Locality: St. Francois-de-M

Dates Cast:

		Alk %	Temp C
A,B	08-Aug-88	0.92	80
C,D	08-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
10-Aug-88	10-Aug-88	2	1.580	1.731	0.000	0.000	0.000	0.000
11-Aug-88	11-Aug-88	3	1.581	1.725	.000	-0.002	-0.001	-0.002
12-Aug-88	12-Aug-88	4	1.655	1.783	0.030	0.020	0.025	0.027
15-Aug-88	15-Aug-88	7	2.174	2.301	0.234	0.224	0.229	0.223
16-Aug-88	16-Aug-88	8	2.294	2.406	0.281	0.266	0.273	0.273
17-Aug-88	17-Aug-88	9	2.408	2.527	0.326	0.313	0.320	0.316
18-Aug-88	18-Aug-88	10	2.489	2.589	0.358	0.338	0.348	0.349
19-Aug-88	19-Aug-88	11	2.563	2.668	0.387	0.369	0.378	0.377
22-Aug-88	22-Aug-88	14	2.808	2.885	0.483	0.454	0.469	0.472
23-Aug-88	23-Aug-88	15	2.885	2.963	0.514	0.485	0.499	0.500
24-Aug-88	24-Aug-88	16	2.947	3.013	0.538	0.505	0.521	0.525
25-Aug-88	25-Aug-88	17	3.016	3.081	0.565	0.531	0.548	0.550
26-Aug-88	26-Aug-88	18	3.071	3.130	0.587	0.551	0.569	0.572
29-Aug-88	29-Aug-88	21	3.180	3.303	0.630	0.619	0.624	0.633
30-Aug-88	30-Aug-88	22	3.308	3.341	0.680	0.634	0.657	0.662
31-Aug-88	31-Aug-88	23	3.349	3.381	0.696	0.650	0.673	0.675
17-Oct-88	17-Oct-88	70	4.363	4.324	1.096	1.021	1.058	1.076

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR8 Oberholster Method

Rock Type: Greywacke

Locality: Springhill

Dates Cast:

		Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
11-Aug-88	11-Aug-88	2	1.556	1.718	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.541	1.705	-0.006	-0.005	-0.006
15-Aug-88	15-Aug-88	6	1.686	1.843	0.051	0.049	0.050
16-Aug-68	16-Aug-88	7	1.764	1.923	0.082	0.081	0.081
17-Aug-88	17-Aug-88	8	1.877	1.988	0.126	0.106	0.116
18-Aug-88	18-Aug-88	9	1.960	2.116	0.159	0.157	0.158
19-Aug-88	19-Aug-88	10	2.087	2.228	0.209	0.201	0.205
22-Aug-88	22-Aug-88	13	2.410	2.539	0.336	0.323	0.330
23-Aug-88	23-Aug-88	14	2.472	2.595	0.361	0.345	0.353
24-Aug-88	24-Aug-88	15	2.526	2.650	0.382	0.367	0.374
25-Aug-88	25-Aug-88	16	2.583	2.698	0.404	0.386	0.395
26-Aug-88	26-Aug-88	17	2.638	2.760	0.426	0.410	0.418
29-Aug-88	29-Aug-88	20	2.807	2.914	0.493	0.471	0.482
30-Aug-88	30-Aug-88	21	2.854	2.964	0.511	0.491	0.501
31-Aug-88	31-Aug-88	22	2.913	3.016	0.534	0.511	0.523
17-Oct-88	17-Oct-88	69	4.002	4.064	0.963	0.924	0.943

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR8 Oberholster Method

Rock Type: Greywacke

Locality: Springhill

Dates Cast: Alk % Temp C

A,B 09-Aug-88 0.92 80

C,D 09-Aug-88 0.92 80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
11-Aug-88	11-Aug-88	2	1.108	1.134	0.000	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.098	1.128	-0.004	-0.002	-0.003	-0.004
15-Aug-88	15-Aug-88	6	1.230	1.264	0.048	0.051	0.050	0.050
16-Aug-88	16-Aug-88	7	1.334	1.373	0.089	0.094	0.092	0.086
17-Aug-88	17-Aug-88	8	1.403	1.466	0.116	0.131	0.123	0.120
18-Aug-88	18-Aug-88	9	1.534	1.583	0.168	0.177	0.172	0.165
19-Aug-88	19-Aug-88	10	1.643	1.697	0.211	0.222	0.216	0.211
22-Aug-88	22-Aug-88	13	1.973	2.052	0.341	0.361	0.351	0.340
23-Aug-88	23-Aug-88	14	2.020	2.099	0.359	0.380	0.369	0.361
24-Aug-88	24-Aug-88	15	2.081	2.164	0.383	0.406	0.394	0.384
25-Aug-88	25-Aug-88	16	2.124	2.206	0.400	0.422	0.411	0.403
26-Aug-88	26-Aug-88	17	2.184	2.276	0.424	0.450	0.437	0.427
29-Aug-88	29-Aug-88	20	2.328	2.423	0.480	0.507	0.494	0.488
30-Aug-88	30-Aug-88	21	2.385	2.483	0.503	0.531	0.517	0.509
31-Aug-88	31-Aug-88	22	2.428	2.528	0.520	0.549	0.534	0.528
17-Oct-88	17-Oct-88	69	3.449	3.620	0.922	0.979	0.950	0.947

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY -- MORTAR BAR TEST MEASUREMENTS

Sample: OR9 Oberholster Method

Rock Type: Greywacke

Locality: Nigadoo River

Dates Cast:		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
12-Aug-88	12-Aug-88	2	2.004	2.050	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.038	2.085	0.013	0.014	0.014
16-Aug-88	16-Aug-88	6	2.055	2.106	0.020	0.022	0.021
17-Aug-88	17-Aug-88	7	2.149	2.205	0.057	0.061	0.059
18-Aug-88	18-Aug-88	8	2.229	2.286	0.089	0.093	0.091
19-Aug-88	19-Aug-88	9	2.352	2.405	0.137	0.140	0.138
22-Aug-88	22-Aug-88	12	2.563	2.604	0.220	0.218	0.219
23-Aug-88	23-Aug-88	13	2.641	2.690	0.251	0.252	0.251
24-Aug-88	24-Aug-88	14	2.668	2.719	0.261	0.263	0.262
25-Aug-88	25-Aug-88	15	2.740	2.795	0.290	0.293	0.292
26-Aug-88	26-Aug-88	16	2.783	2.827	0.307	0.306	0.306
29-Aug-88	29-Aug-88	19	2.936	2.982	0.367	0.367	0.367
30-Aug-88	30-Aug-88	20	2.961	3.000	0.377	0.374	0.375
31-Aug-88	31-Aug-88	21	3.022	3.065	0.401	0.400	0.400
01-Sep-88	01-Sep-88	22	3.015	3.059	0.398	0.397	0.398
17-Oct-88	17-Oct-88	68	3.912	3.940	0.751	0.744	0.748

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR9 Oberholster Method

Rock Type: Greywacke

Locality: Nigadoo River

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
12-Aug-88	12-Aug-88	2	2.096	1.948	0.000	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.136	1.994	0.016	0.018	0.017	0.015
16-Aug-88	16-Aug-88	6	2.158	2.010	0.024	0.024	0.024	0.023
17-Aug-88	17-Aug-88	7	2.272	2.127	0.069	0.070	0.070	0.064
18-Aug-88	18-Aug-88	8	2.374	2.217	0.109	0.106	0.108	0.099
19-Aug-88	19-Aug-88	9	2.514	2.360	0.165	0.162	0.163	0.151
22-Aug-88	22-Aug-88	12	2.750	2.581	0.257	0.249	0.253	0.236
23-Aug-88	23-Aug-88	13	2.843	2.670	0.294	0.284	0.289	0.270
24-Aug-88	24-Aug-88	14	2.871	2.699	0.305	0.296	0.300	0.281
25-Aug-88	25-Aug-88	15	2.966	2.800	0.343	0.335	0.339	0.315
26-Aug-88	26-Aug-88	16	2.990	2.815	0.352	0.341	0.347	0.326
29-Aug-88	29-Aug-88	19	3.168	2.996	0.422	0.413	0.417	0.392
30-Aug-88	30-Aug-88	20	3.186	3.007	0.429	0.417	0.423	0.399
31-Aug-88	31-Aug-88	21	3.261	3.088	0.459	0.449	0.454	0.427
01-Sep-88	01-Sep-88	22	3.262	3.078	0.459	0.445	0.452	0.425
17-Oct-88	17-Oct-88	68	4.176	4.007	0.819	0.811	0.815	0.781

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR24 Oberholster Method

Rock Type: Limestone

Locality: Muniac

Dates Cast:		Alk %	Temp C	Sample Lengths:
A,B	10-Aug-88	0.92	80	
C,D	10-Aug-88	0.92	80	
				254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
12-Aug-88	12-Aug-88	2	1.232	1.294	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	1.418	1.481	0.073	0.074	0.073
16-Aug-88	16-Aug-88	6	1.592	1.655	0.142	0.142	0.142
17-Aug-88	17-Aug-88	7	1.775	1.824	0.214	0.209	0.211
18-Aug-88	18-Aug-88	8	1.922	1.970	0.272	0.266	0.269
19-Aug-88	19-Aug-88	9	2.033	2.079	0.315	0.309	0.312
22-Aug-88	22-Aug-88	12	2.303	2.350	0.422	0.416	0.419
23-Aug-88	23-Aug-88	13	2.396	2.434	0.458	0.449	0.454
24-Aug-88	24-Aug-88	14	2.445	2.495	0.478	0.473	0.475
25-Aug-88	25-Aug-88	15	2.524	2.556	0.509	0.497	0.503
26-Aug-88	26-Aug-88	16	2.567	2.610	0.526	0.518	0.522
29-Aug-88	29-Aug-88	19	2.734	2.766	0.591	0.580	0.585
30-Aug-88	30-Aug-88	20	2.805	2.835	0.619	0.607	0.613
31-Aug-88	31-Aug-88	21	2.855	2.880	0.639	0.624	0.632
01-Sep-88	01-Sep-88	22	2.918	2.943	0.664	0.649	0.656
17-Oct-88	17-Oct-88	68	4.250	4.191	1.188	1.141	1.164

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OR24 Oberholster Method

Rock Type: Limestone

Locality: Muniac

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
12-Aug-88	12-Aug-88	2	2.450	2.506	0.000	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	2.655	2.694	0.081	0.074	0.077	0.075
16-Aug-88	16-Aug-88	6	2.832	2.865	0.150	0.141	0.146	0.144
17-Aug-88	17-Aug-88	7	3.007	3.024	0.219	0.204	0.212	0.211
18-Aug-88	18-Aug-88	8	3.165	3.189	0.281	0.269	0.275	0.272
19-Aug-88	19-Aug-88	9	3.274	3.286	0.324	0.307	0.316	0.314
22-Aug-88	22-Aug-88	12	3.563	3.569	0.438	0.419	0.428	0.424
23-Aug-88	23-Aug-88	13	3.640	3.638	0.469	0.446	0.457	0.455
24-Aug-88	24-Aug-88	14	3.715	3.713	0.498	0.475	0.487	0.481
25-Aug-88	25-Aug-88	15	3.767	3.757	0.519	0.493	0.506	0.504
26-Aug-88	26-Aug-88	16	3.846	3.824	0.550	0.519	0.534	0.528
29-Aug-88	29-Aug-88	19	3.983	3.966	0.604	0.575	0.589	0.587
30-Aug-88	30-Aug-88	20	4.053	4.026	0.631	0.598	0.615	0.614
31-Aug-88	31-Aug-88	21	4.112	4.089	0.654	0.623	0.639	0.635
01-Sep-88	01-Sep-88	22	4.158	4.131	0.672	0.640	0.656	0.656
17-Oct-88	17-Oct-88	68	5.475	5.380	1.191	1.131	1.161	1.163

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OGI Oberholster Method

Rock Type: Gravel

Locality: Viel

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
12-Aug-88	12-Aug-88	2	1.537	0.698	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	1.603	0.754	0.026	0.022	0.024
16-Aug-88	16-Aug-88	6	1.701	0.865	0.065	0.066	0.065
17-Aug-88	17-Aug-88	7	1.794	0.986	0.101	0.113	0.107
18-Aug-88	18-Aug-88	8	1.904	1.071	0.144	0.147	0.146
19-Aug-88	19-Aug-88	9	2.018	1.183	0.189	0.191	0.190
22-Aug-88	22-Aug-88	12	2.268	1.421	0.288	0.285	0.286
23-Aug-88	23-Aug-88	13	2.325	1.483	0.310	0.309	0.310
24-Aug-88	24-Aug-88	14	2.407	1.555	0.343	0.337	0.340
25-Aug-88	25-Aug-88	15	2.462	1.614	0.364	0.361	0.362
26-Aug-88	26-Aug-88	16	2.537	1.685	0.394	0.389	0.391
29-Aug-88	29-Aug-88	19	2.685	1.844	0.452	0.451	0.452
30-Aug-88	30-Aug-88	20	2.740	1.897	0.474	0.472	0.473
31-Aug-88	31-Aug-88	21	2.799	1.946	0.497	0.491	0.494
01-Sep-88	01-Sep-88	22	2.812	1.966	0.502	0.499	0.501
17-Oct-88	17-Oct-88	68	4.081	3.209	1.002	0.989	0.995

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: DG1 Oberholster Method

Rock Type: Gravel

Locality: Viel

Dates Cast:

		Alk %	Temp C
A,B	10-Aug-88	0.92	80
C,D	10-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
12-Aug-88	12-Aug-88	2	1.187	1.080	0.000	0.000	0.000	0.000
15-Aug-88	15-Aug-88	5	1.266	1.162	0.031	0.032	0.032	0.028
16-Aug-88	16-Aug-88	6	1.382	1.270	0.077	0.075	0.076	0.070
17-Aug-88	17-Aug-88	7	1.506	1.355	0.126	0.108	0.117	0.112
18-Aug-88	18-Aug-88	8	1.599	1.489	0.162	0.161	0.162	0.154
19-Aug-88	19-Aug-88	9	1.712	1.574	0.207	0.194	0.201	0.195
22-Aug-88	22-Aug-88	12	1.979	1.814	0.312	0.289	0.300	0.293
23-Aug-88	23-Aug-88	13	2.051	1.892	0.340	0.320	0.330	0.320
24-Aug-88	24-Aug-88	14	2.117	1.939	0.366	0.338	0.352	0.346
25-Aug-88	25-Aug-88	15	2.181	2.006	0.391	0.365	0.378	0.370
26-Aug-88	26-Aug-88	16	2.257	2.075	0.421	0.392	0.406	0.399
29-Aug-88	29-Aug-88	19	2.426	2.249	0.488	0.460	0.474	0.463
30-Aug-88	30-Aug-88	20	2.472	2.284	0.506	0.474	0.490	0.481
31-Aug-88	31-Aug-88	21	2.532	2.336	0.530	0.494	0.512	0.503
01-Sep-88	01-Sep-88	22	2.559	2.381	0.540	0.512	0.526	0.513
17-Oct-88	17-Oct-88	68	3.789	3.515	1.024	0.959	0.992	0.993

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OG3 Oberholster Method

Rock Type: Gravel

Locality: McCain

	Dates Cast:	Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
11-Aug-88	11-Aug-88	2	3.331	3.069	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	3.297	3.057	-0.013	-0.005	-0.009
15-Aug-88	15-Aug-88	6	3.364	3.119	0.013	0.020	0.016
16-Aug-88	16-Aug-88	7	3.382	3.132	0.020	0.025	0.022
17-Aug-88	17-Aug-88	8	3.442	3.206	0.044	0.054	0.049
18-Aug-88	18-Aug-88	9	3.487	3.232	0.061	0.064	0.063
19-Aug-88	19-Aug-88	10	3.565	3.311	0.092	0.095	0.094
22-Aug-88	22-Aug-88	13	3.731	3.461	0.157	0.154	0.156
23-Aug-88	23-Aug-88	14	3.790	3.528	0.181	0.181	0.181
24-Aug-88	24-Aug-88	15	3.817	3.544	0.191	0.187	0.189
25-Aug-88	25-Aug-88	16	3.885	3.614	0.218	0.215	0.216
26-Aug-88	26-Aug-88	17	3.900	3.631	0.224	0.221	0.223
29-Aug-88	29-Aug-88	20	4.063	3.781	0.288	0.280	0.284
30-Aug-88	30-Aug-88	21	4.072	3.787	0.292	0.283	0.287
31-Aug-88	31-Aug-88	22	4.131	3.839	0.315	0.303	0.309
17-Oct-88	17-Oct-88	69	5.137	4.800	0.711	0.681	0.696

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

	Sample:	OG3			Oberholster Method
	Rock Type:	Gravel			
	Locality:	McCain			
	Dates Cast:		Alk %	Temp C	Sample Lengths:
A,B	09-Aug-88		0.92	80	
C,D	09-Aug-88		0.92	80	254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
11-Aug-88	11-Aug-88	2	1.598	1.571	0.000	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.571	1.549	-0.011	-0.009	-0.010	-0.009
15-Aug-88	15-Aug-88	6	1.652	1.622	0.021	0.020	0.021	0.019
16-Aug-88	16-Aug-88	7	1.667	1.636	0.027	0.026	0.026	0.024
17-Aug-88	17-Aug-88	8	1.748	1.714	0.059	0.056	0.058	0.053
18-Aug-88	18-Aug-88	9	1.784	1.745	0.073	0.069	0.071	0.067
19-Aug-88	19-Aug-88	10	1.870	1.831	0.107	0.102	0.105	0.099
22-Aug-88	22-Aug-88	13	2.025	1.978	0.168	0.160	0.164	0.160
23-Aug-88	23-Aug-88	14	2.099	2.052	0.197	0.189	0.193	0.187
24-Aug-88	24-Aug-88	15	2.113	2.059	0.203	0.192	0.197	0.193
25-Aug-88	25-Aug-88	16	2.181	2.125	0.230	0.218	0.224	0.220
26-Aug-88	26-Aug-88	17	2.203	2.152	0.238	0.229	0.233	0.228
29-Aug-88	29-Aug-88	20	2.354	2.295	0.298	0.285	0.291	0.288
30-Aug-88	30-Aug-88	21	2.368	2.309	0.303	0.291	0.297	0.292
31-Aug-88	31-Aug-88	22	2.418	2.347	0.323	0.306	0.314	0.312
17-Oct-88	17-Oct-88	69	3.330	3.271	0.682	0.669	0.676	0.686

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: 0G7 Oberholster Method

Rock Type: Gravel

Locality: Valley Road

	Dates Cast:	Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
11-Aug-88	11-Aug-88	2	1.941	2.098	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.949	2.108	0.003	0.004	0.004
15-Aug-88	15-Aug-88	6	2.024	2.179	0.033	0.032	0.032
16-Aug-88	16-Aug-88	7	2.128	2.287	0.074	0.074	0.074
17-Aug-88	17-Aug-88	8	2.195	2.357	0.100	0.102	0.101
18-Aug-88	18-Aug-88	9	2.305	2.476	0.143	0.149	0.146
19-Aug-88	19-Aug-88	10	2.349	2.518	0.161	0.165	0.163
22-Aug-88	22-Aug-88	13	2.584	2.763	0.253	0.262	0.257
23-Aug-88	23-Aug-88	14	2.621	2.800	0.268	0.276	0.272
24-Aug-88	24-Aug-88	15	2.702	2.875	0.300	0.306	0.303
25-Aug-88	25-Aug-88	16	2.710	2.885	0.303	0.310	0.306
26-Aug-88	26-Aug-88	17	2.770	2.954	0.326	0.337	0.332
29-Aug-88	29-Aug-88	20	2.890	3.080	0.374	0.387	0.380
30-Aug-88	30-Aug-88	21	2.931	3.118	0.390	0.402	0.396
31-Aug-88	31-Aug-88	22	3.004	3.197	0.419	0.433	0.426
01-Sep-88	01-Sep-88	23	3.027	3.211	0.428	0.438	0.433
17-Oct-88	17-Oct-88	69	4.015	4.208	0.817	0.831	0.824

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: 0G7 Oberholster Method

Rock Type: Gravel

Locality: Valley Road

	Dates Cast:	Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
11-Aug-88	11-Aug-88	2	2.042	2.129	0.000	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	2.046	2.142	0.002	0.005	0.003	0.003
15-Aug-88	15-Aug-88	6	2.120	2.211	0.031	0.032	0.031	0.032
16-Aug-88	16-Aug-88	7	2.263	2.363	0.087	0.092	0.090	0.082
17-Aug-88	17-Aug-88	8	2.349	2.429	0.121	0.118	0.119	0.110
18-Aug-88	18-Aug-88	9	2.491	2.579	0.177	0.177	0.177	0.162
19-Aug-88	19-Aug-88	10	2.543	2.620	0.197	0.193	0.195	0.179
22-Aug-88	22-Aug-88	13	2.829	2.901	0.310	0.304	0.307	0.282
23-Aug-88	23-Aug-88	14	2.865	2.934	0.324	0.317	0.320	0.296
24-Aug-88	24-Aug-88	15	2.950	3.013	0.357	0.348	0.353	0.328
25-Aug-88	25-Aug-88	16	2.970	3.039	0.365	0.358	0.362	0.334
26-Aug-88	26-Aug-88	17	3.040	3.107	0.393	0.385	0.389	0.360
29-Aug-88	29-Aug-88	20	3.180	3.245	0.448	0.439	0.444	0.412
30-Aug-88	30-Aug-88	21	3.208	3.260	0.459	0.445	0.452	0.424
31-Aug-88	31-Aug-88	22	3.296	3.354	0.494	0.482	0.488	0.457
01-Sep-88	01-Sep-88	23	3.309	3.360	0.499	0.485	0.492	0.462
17-Oct-88	17-Oct-88	69	4.367	4.394	0.915	0.892	0.904	0.864

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OG8 Oberholster Method

Rock Type: Gravel

Locality: Chitticks Old Pit

Dates Cast:		Alk %	Temp C	Sample Lengths:
A,B	09-Aug-88	0.92	80	
C,D	09-Aug-88	0.92	80	
				254.0 mm

Actual Date	Optimum Date	Actual Age	Reading A	Reading B	% Elong. A	% Elong. B	% Elong. AB MEAN
11-Aug-88	11-Aug-88	2	1.885	1.791	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.888	1.788	0.001	-0.001	0.000
15-Aug-88	15-Aug-88	6	1.959	1.856	0.029	0.026	0.027
16-Aug-88	16-Aug-88	7	2.030	1.933	0.057	0.056	0.056
17-Aug-88	17-Aug-88	8	2.101	2.001	0.085	0.083	0.084
18-Aug-88	18-Aug-88	9	2.194	2.088	0.122	0.117	0.119
19-Aug-88	19-Aug-88	10	2.262	2.157	0.148	0.144	0.146
22-Aug-88	22-Aug-88	13	2.508	2.385	0.245	0.234	0.240
23-Aug-88	23-Aug-88	14	2.560	2.446	0.266	0.258	0.262
24-Aug-88	24-Aug-88	15	2.635	2.515	0.295	0.285	0.290
25-Aug-88	25-Aug-88	16	2.680	2.556	0.313	0.301	0.307
26-Aug-88	26-Aug-88	17	2.745	2.615	0.339	0.324	0.331
29-Aug-88	29-Aug-88	20	2.877	2.745	0.391	0.376	0.383
30-Aug-88	30-Aug-88	21	2.936	2.795	0.414	0.395	0.405
31-Aug-88	31-Aug-88	22	2.963	2.832	0.424	0.410	0.417
01-Sep-88	01-Sep-88	23	3.003	2.858	0.440	0.420	0.430
17-Oct-88	17-Oct-88	69	3.820	3.656	0.762	0.734	0.748

NEW BRUNSWICK ALKALI AGGREGATE REACTION STUDY - MORTAR BAR TEST MEASUREMENTS

Sample: OG8 Oberholster Method

Rock Type: Gravel

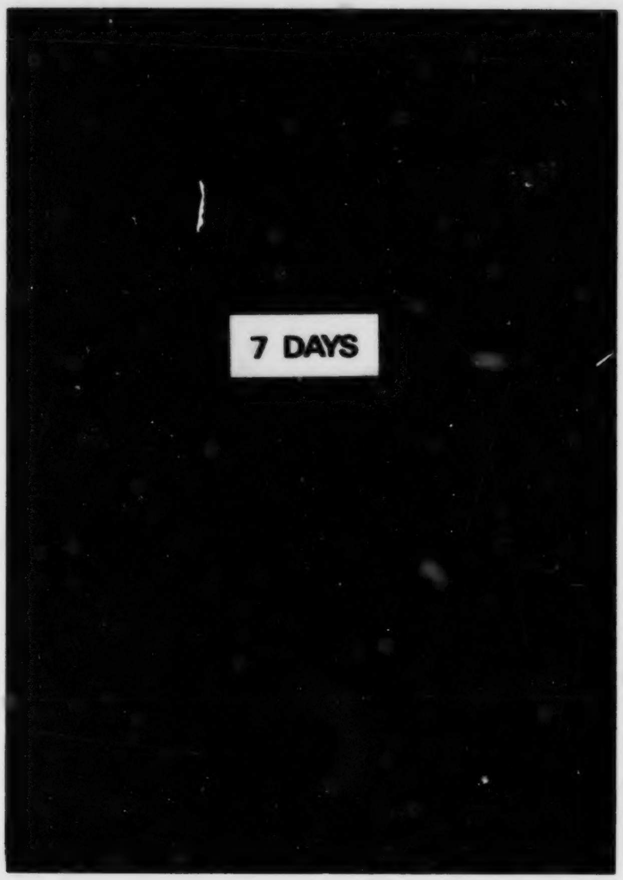
Locality: Chitticks Old Pit

	Dates Cast:	Alk %	Temp C
A,B	09-Aug-88	0.92	80
C,D	09-Aug-88	0.92	80

Sample Lengths:

254.0 mm

Actual Date	Optimum Date	Actual Age	Reading C	Reading D	% Elong. C	% Elong. D	% Elong. CD MEAN	% Elong. MEAN
11-Aug-88	11-Aug-88	2	1.933	2.095	0.000	0.000	0.000	0.000
12-Aug-88	12-Aug-88	3	1.930	2.090	-0.001	-0.002	-0.002	-0.001
15-Aug-88	15-Aug-88	6	2.013	2.163	0.031	0.027	0.029	0.028
16-Aug-88	16-Aug-88	7	2.087	2.238	0.061	0.056	0.058	0.057
17-Aug-88	17-Aug-88	8	2.181	2.330	0.098	0.093	0.095	0.089
18-Aug-88	18-Aug-88	9	2.259	2.394	0.128	0.118	0.123	0.121
19-Aug-88	19-Aug-88	10	2.343	2.479	0.161	0.151	0.156	0.151
22-Aug-88	22-Aug-88	13	2.581	2.698	0.255	0.237	0.246	0.243
23-Aug-88	23-Aug-88	14	2.655	2.769	0.284	0.265	0.275	0.268
24-Aug-88	24-Aug-88	15	2.719	2.814	0.309	0.283	0.296	0.293
25-Aug-88	25-Aug-88	16	2.783	2.884	0.335	0.311	0.323	0.315
26-Aug-88	26-Aug-88	17	2.831	2.926	0.354	0.327	0.340	0.336
29-Aug-88	29-Aug-88	20	2.982	3.075	0.413	0.386	0.399	0.391
30-Aug-88	30-Aug-88	21	3.026	3.108	0.430	0.399	0.415	0.410
31-Aug-88	31-Aug-88	22	3.072	3.155	0.448	0.417	0.433	0.425
01-Sep-88	01-Sep-88	23	3.093	3.167	0.457	0.422	0.439	0.435
17-Oct-88	17-Oct-88	69	3.950	3.974	0.794	0.740	0.767	0.757



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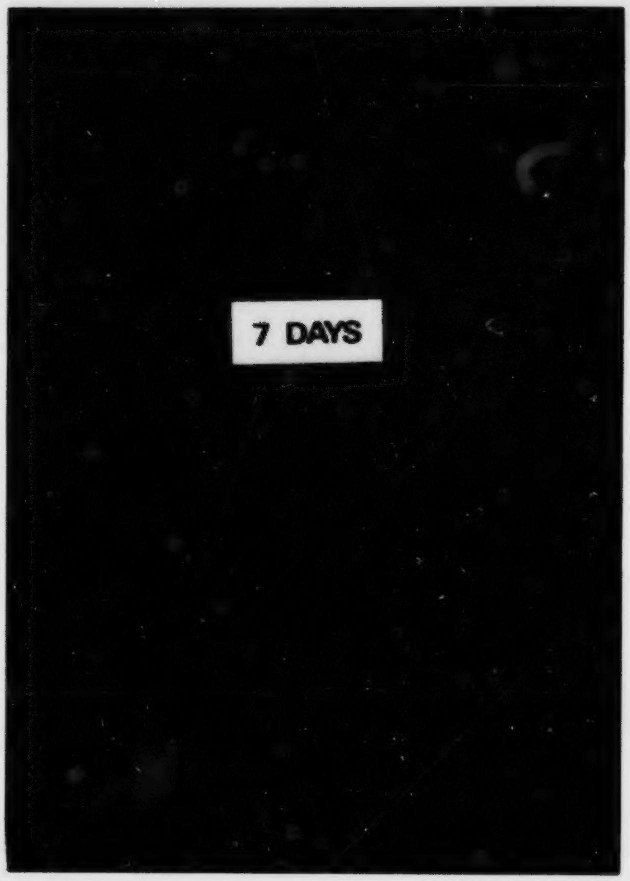

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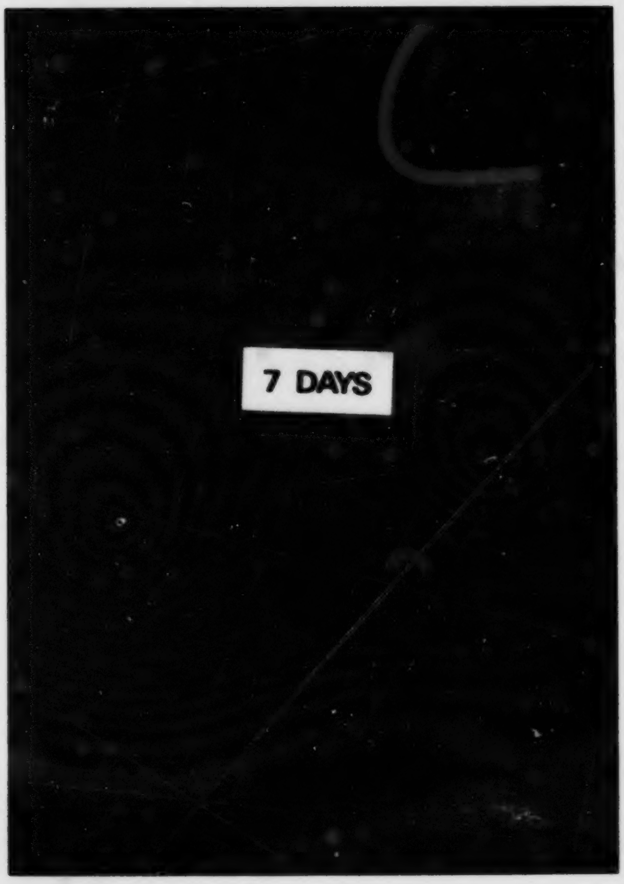

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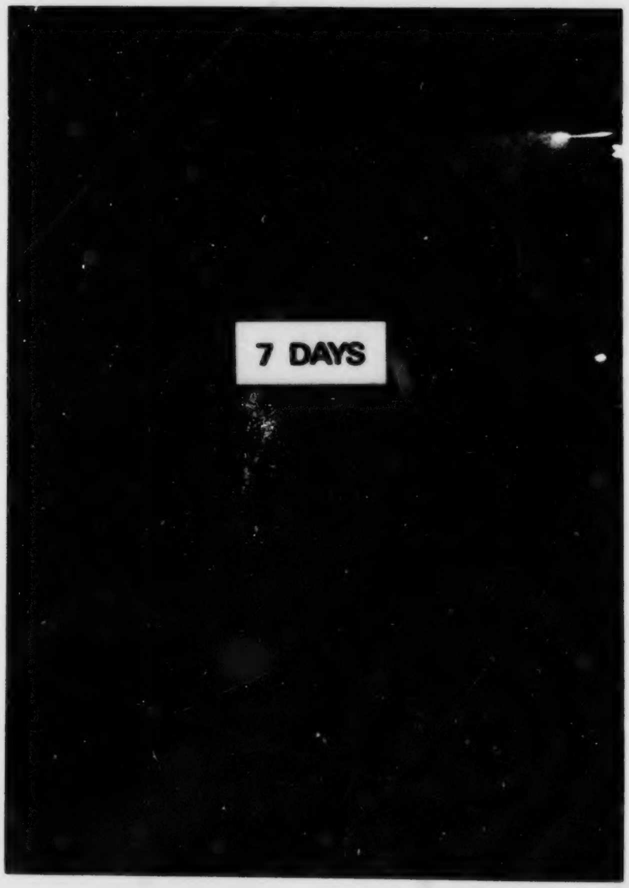

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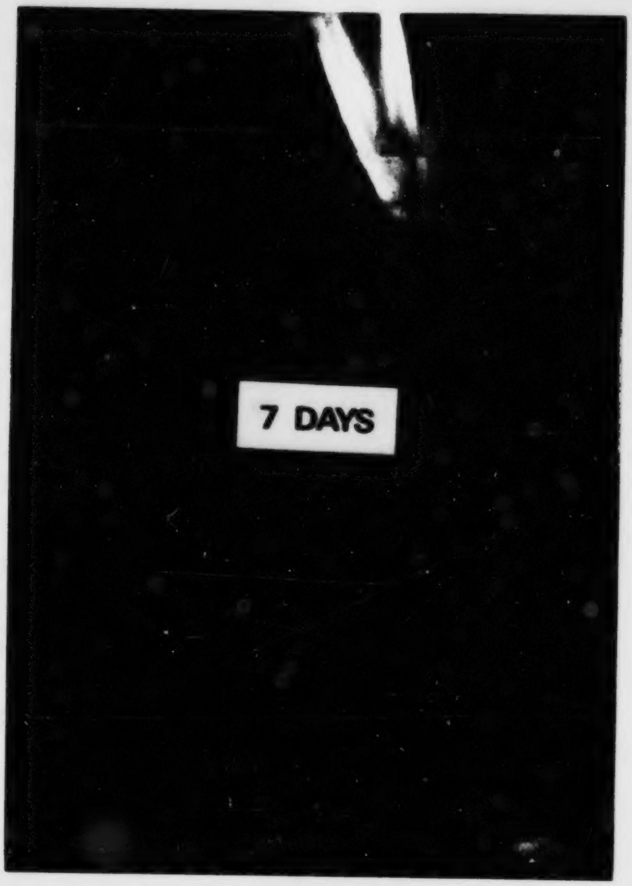
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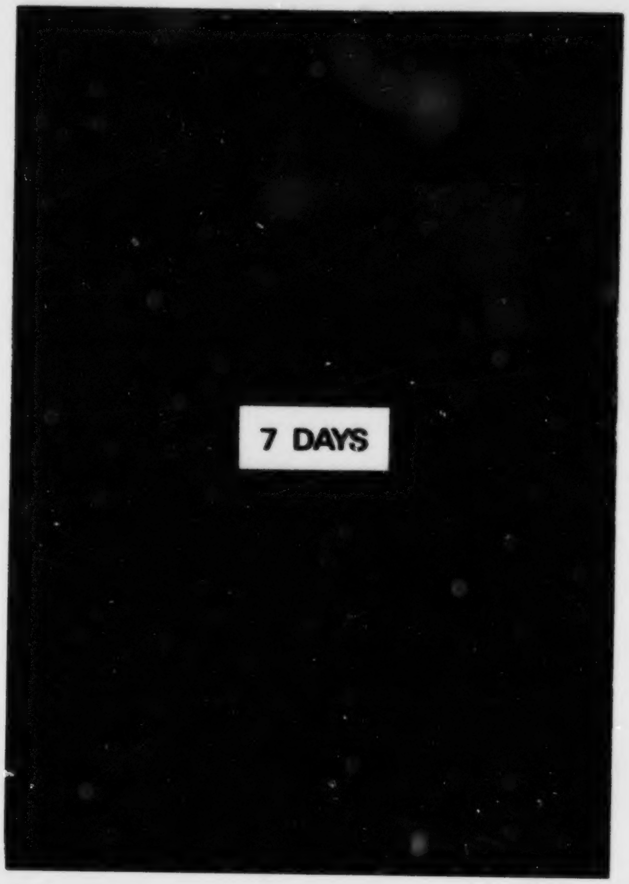
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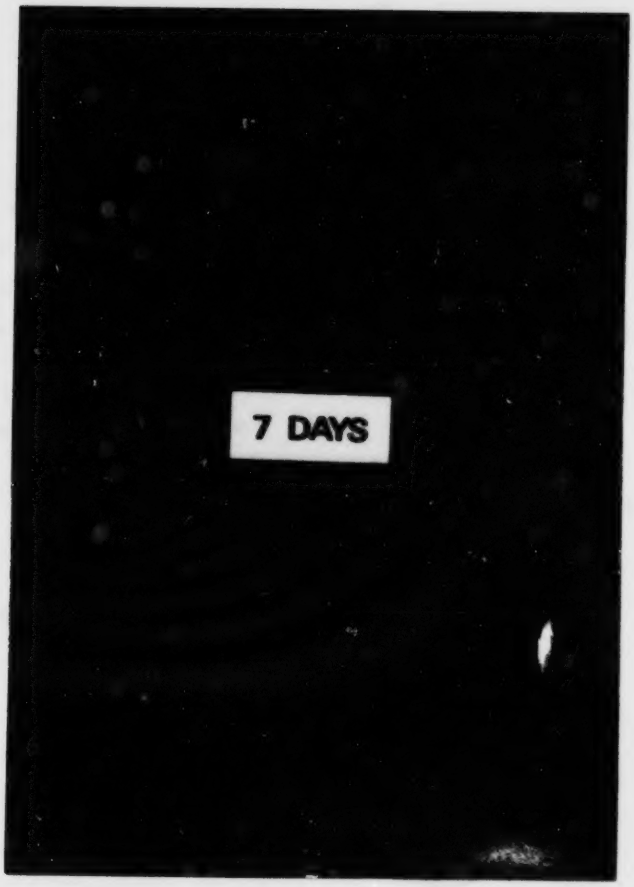
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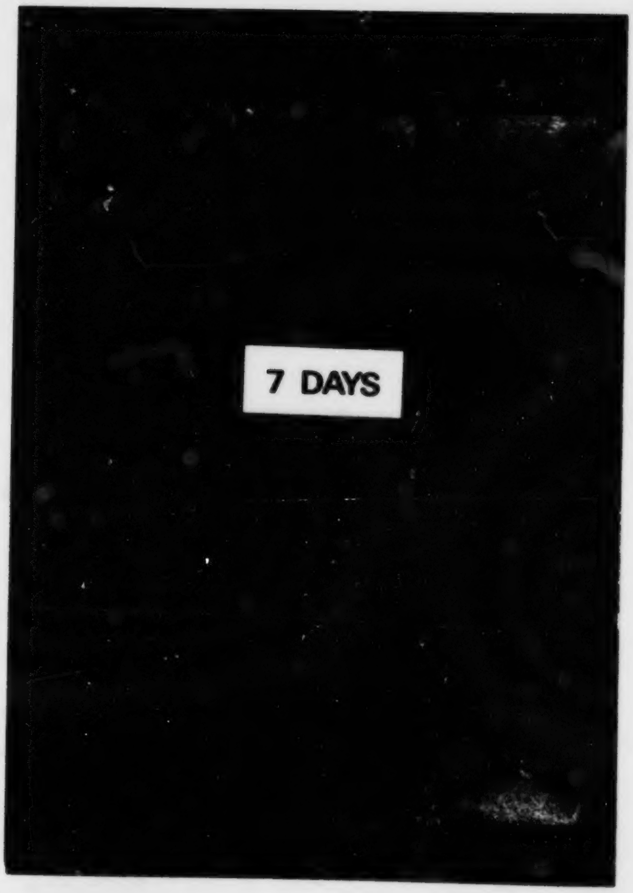
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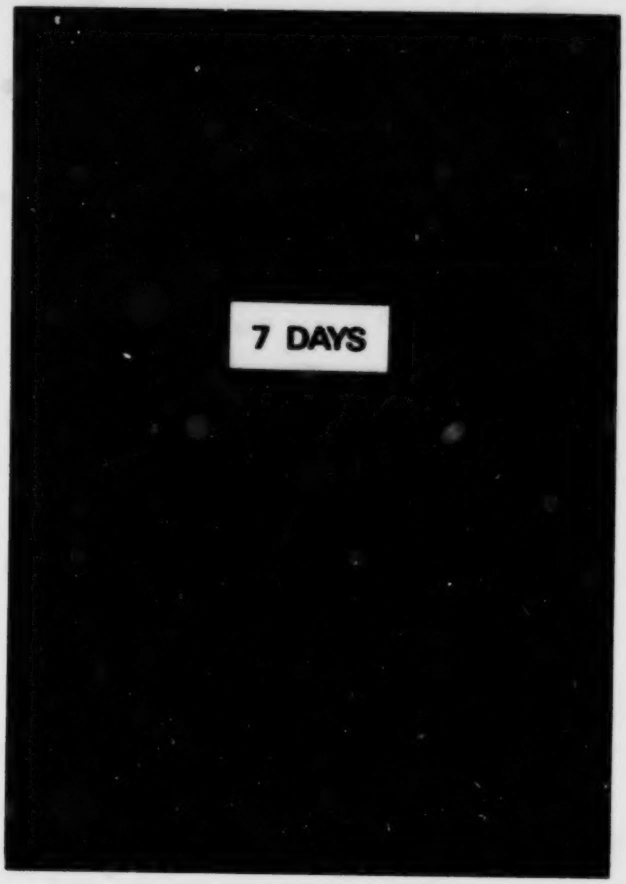
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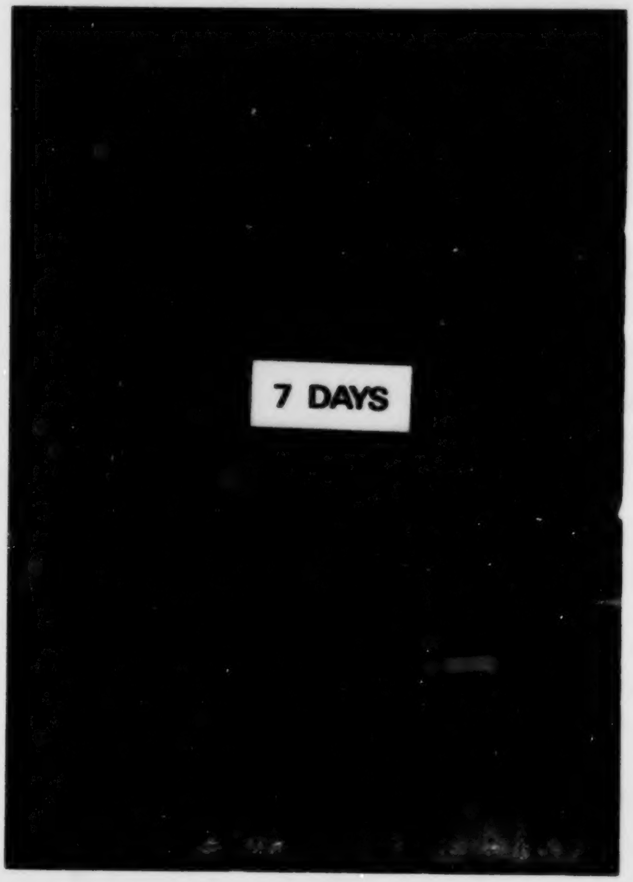
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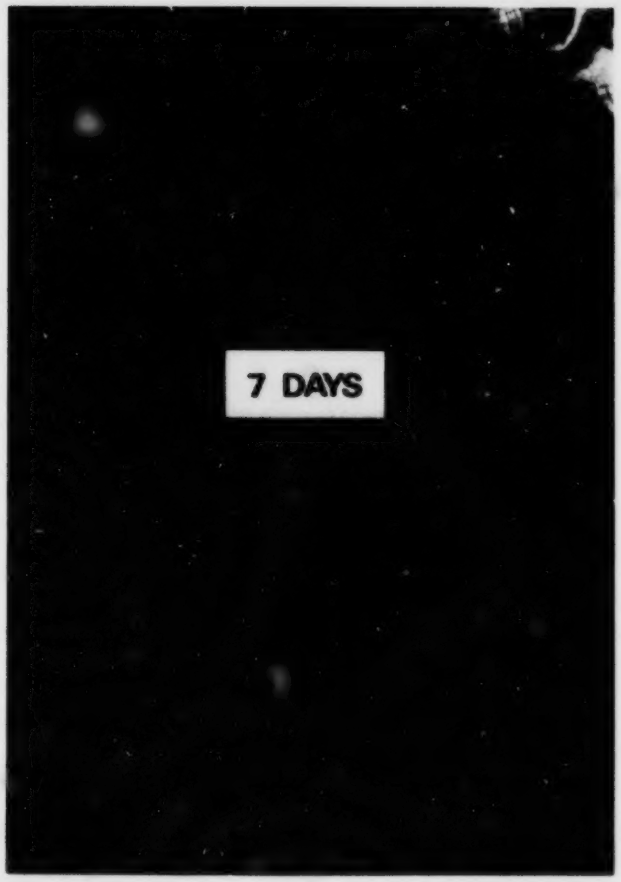
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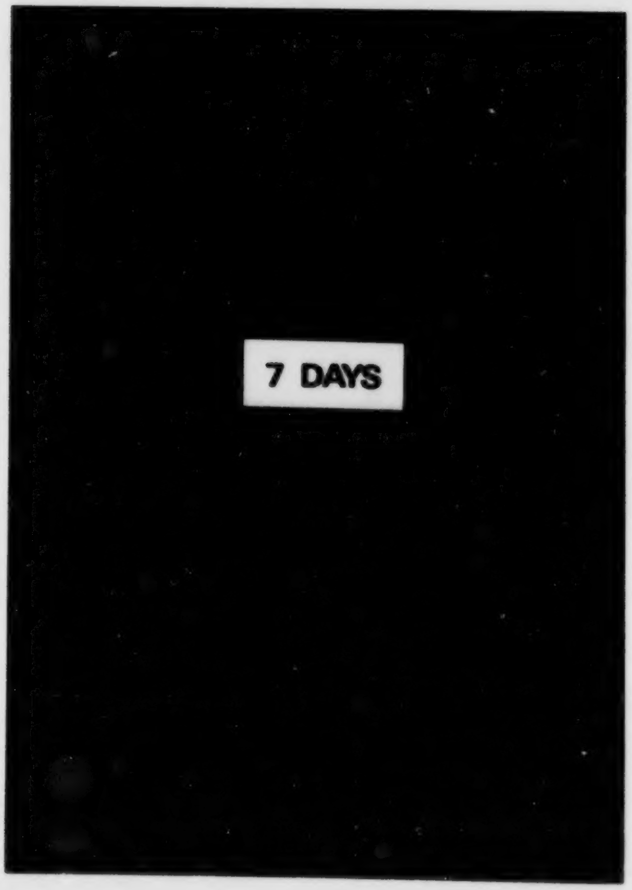
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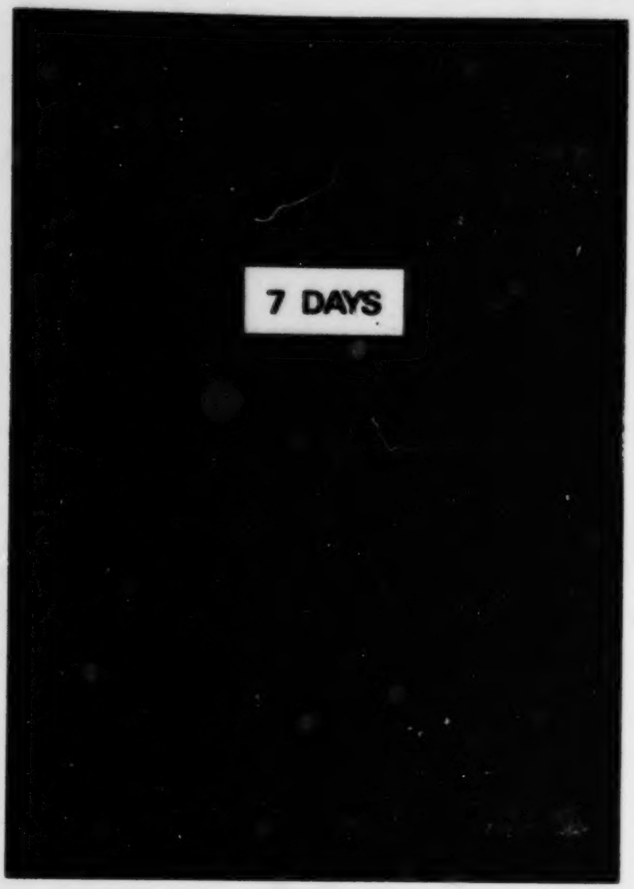
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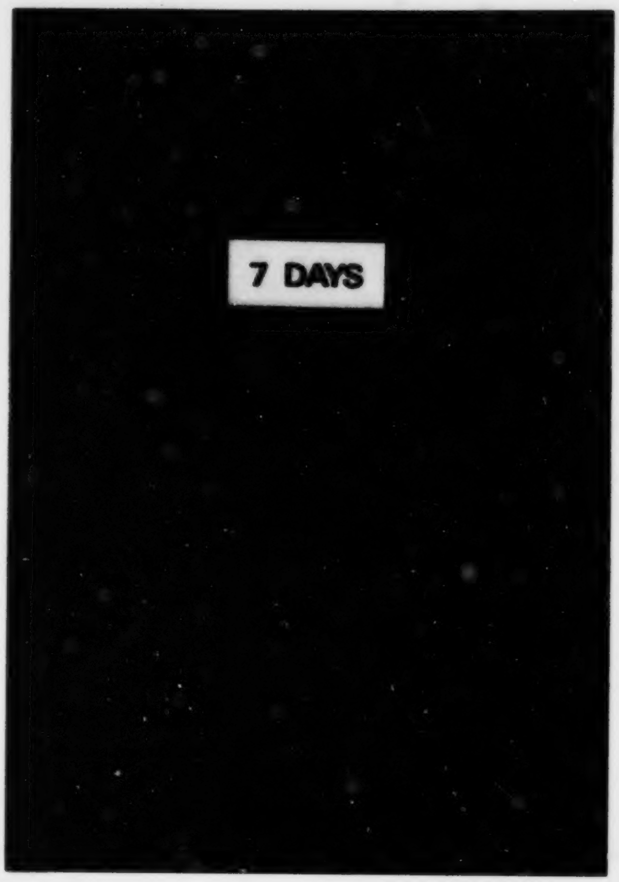
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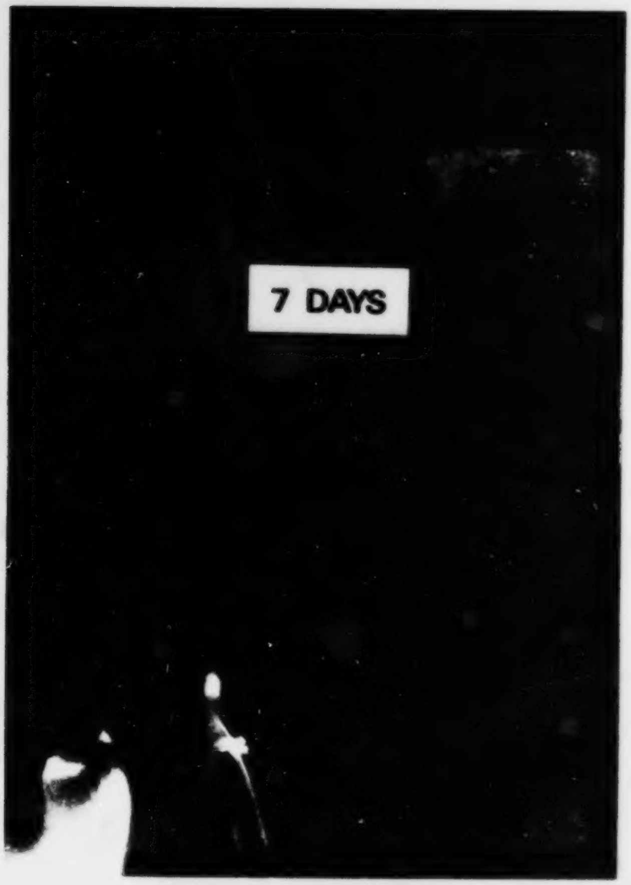
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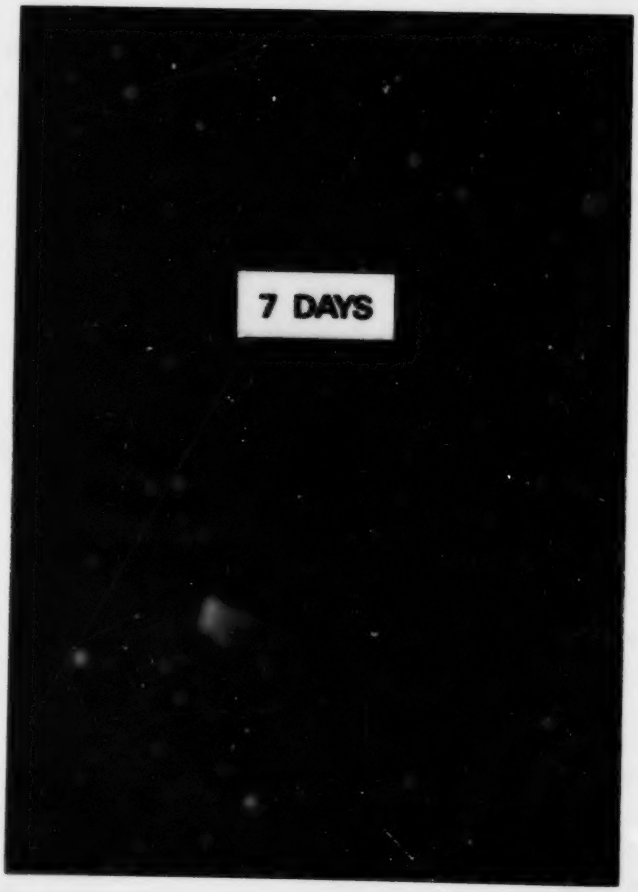
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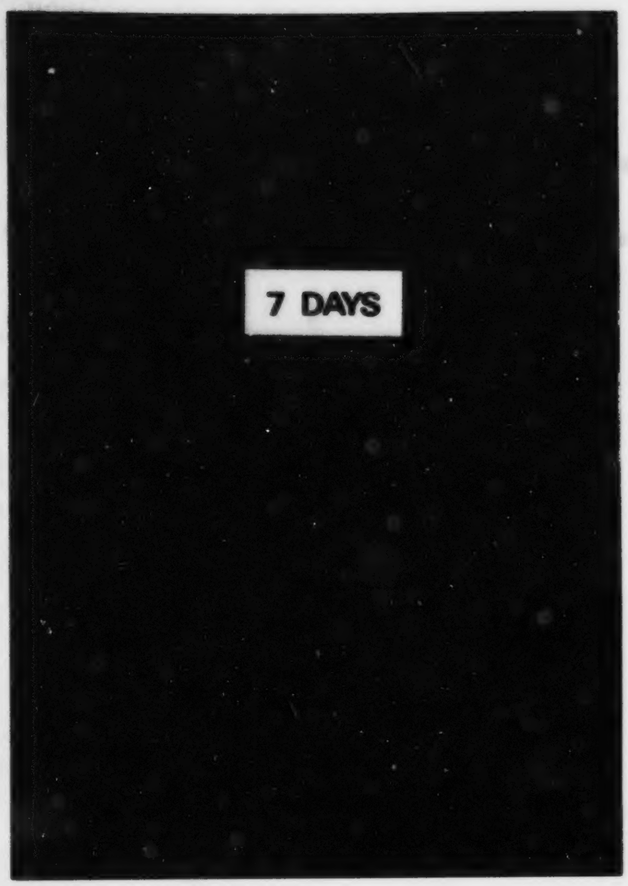
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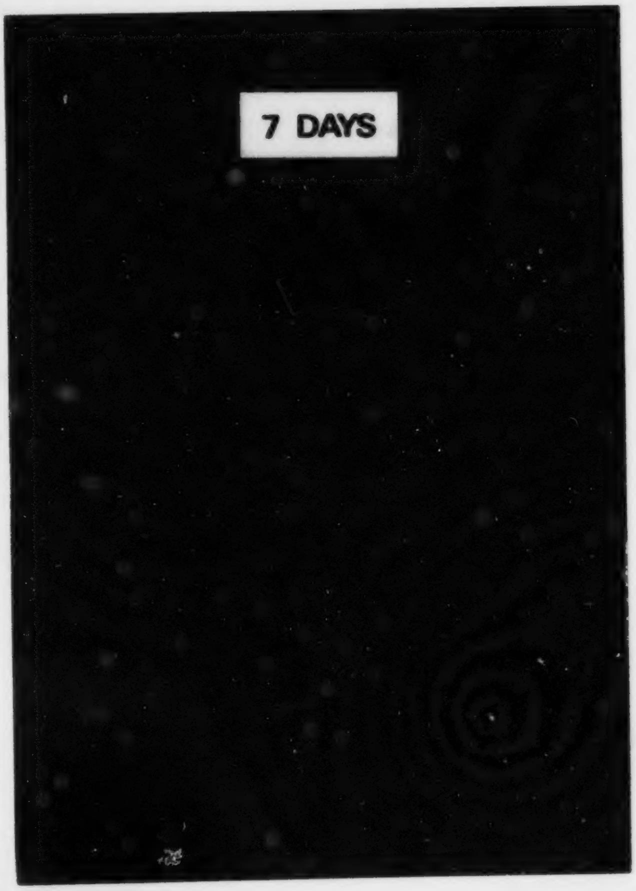
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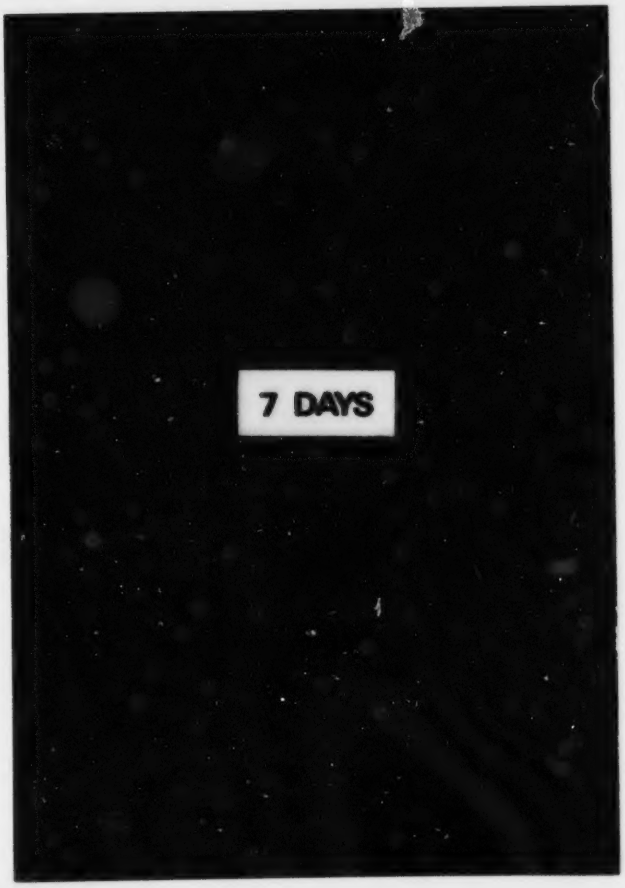
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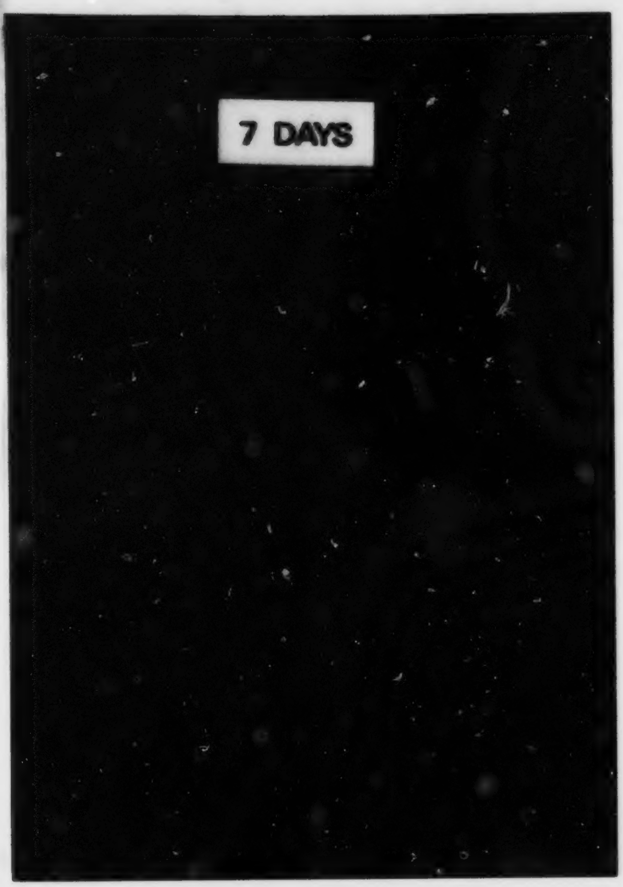
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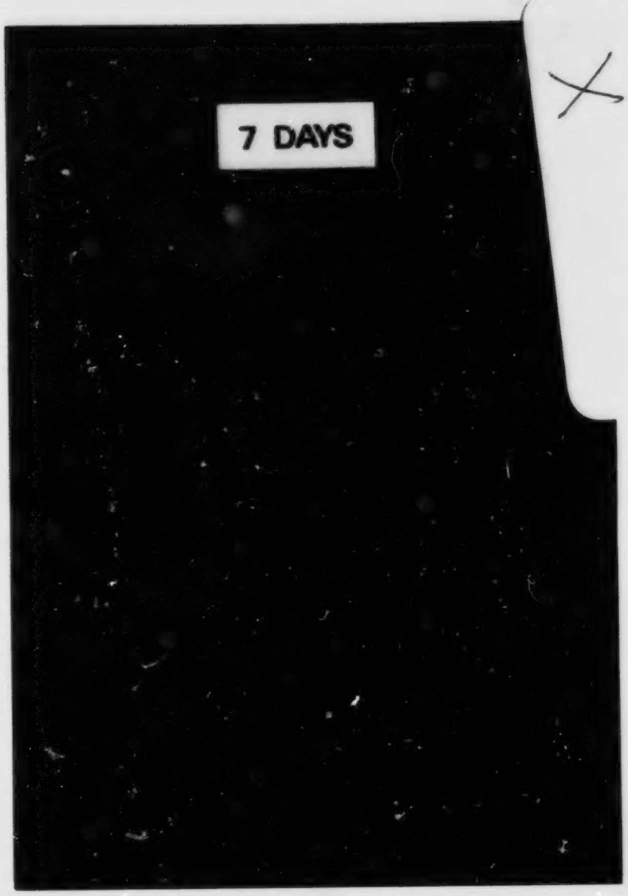
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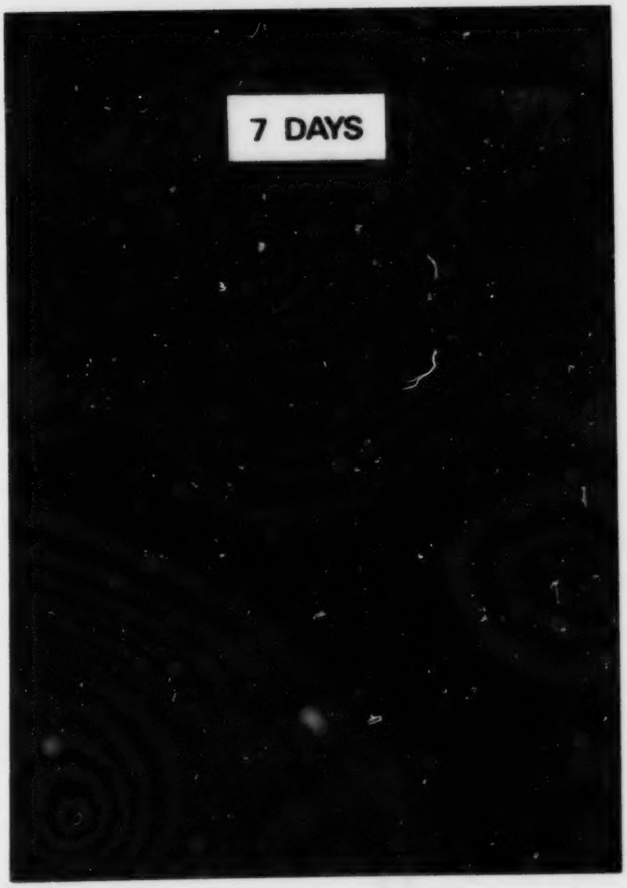
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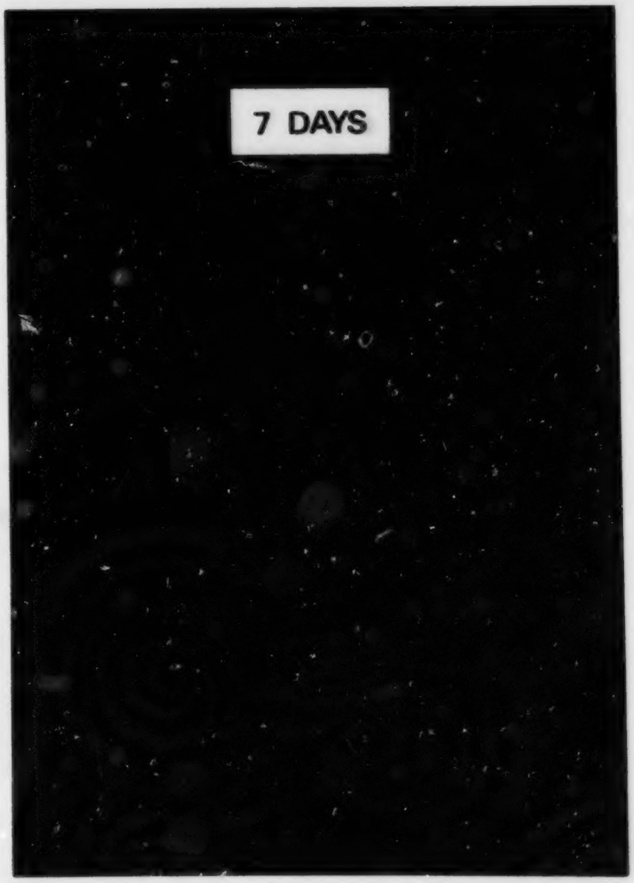
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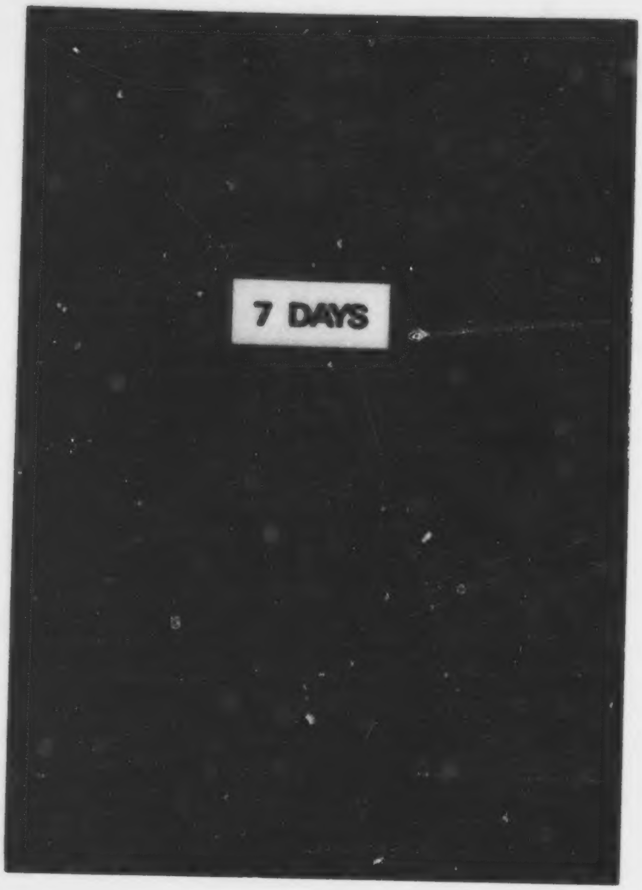
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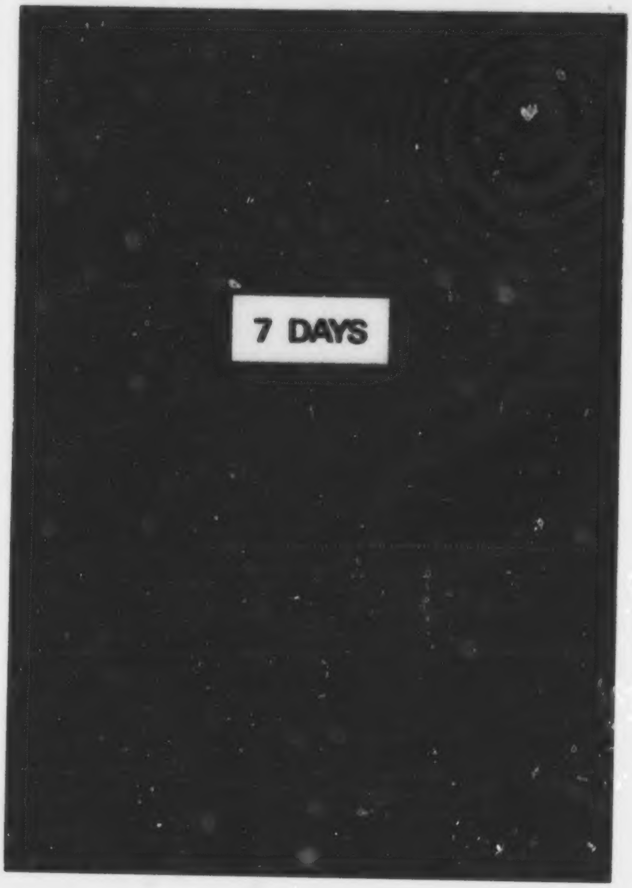
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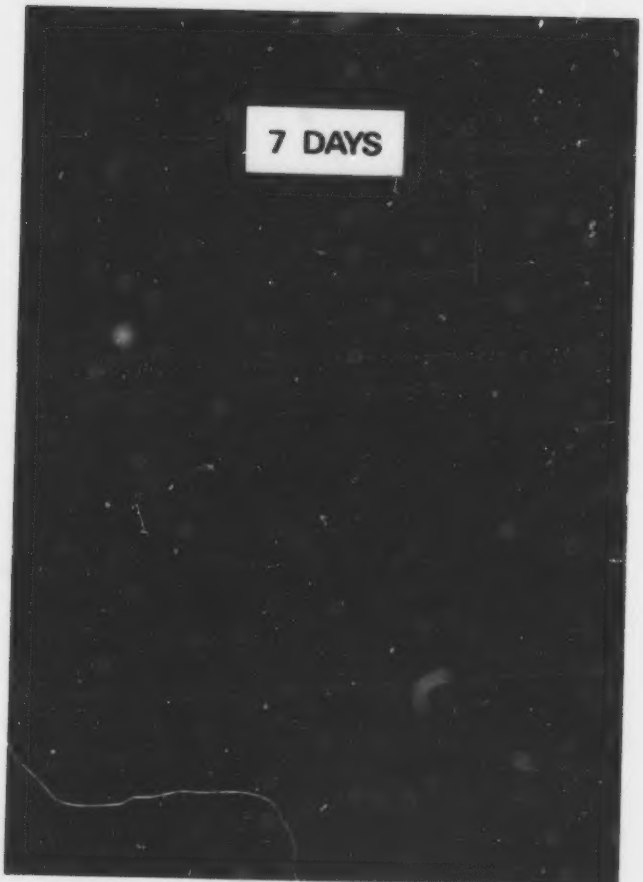
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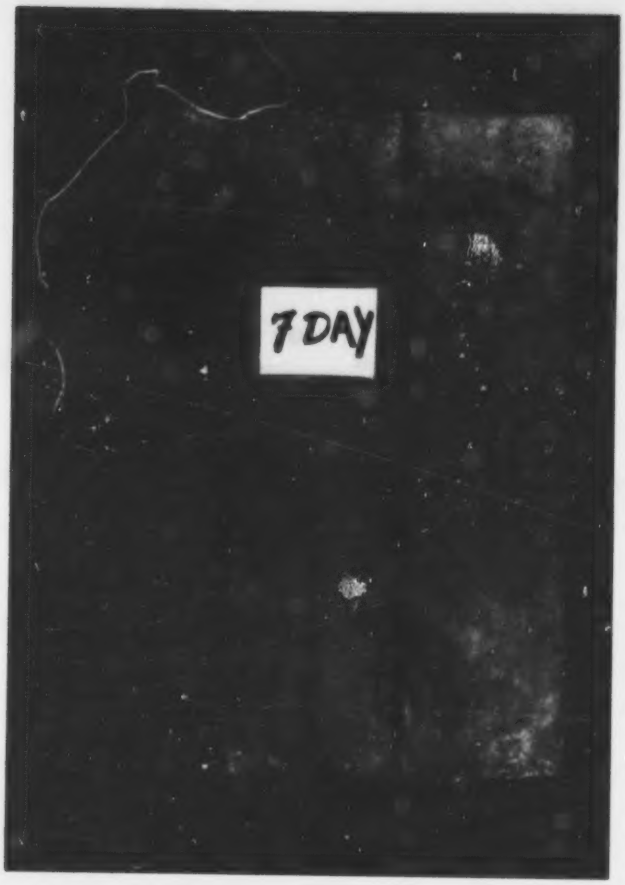
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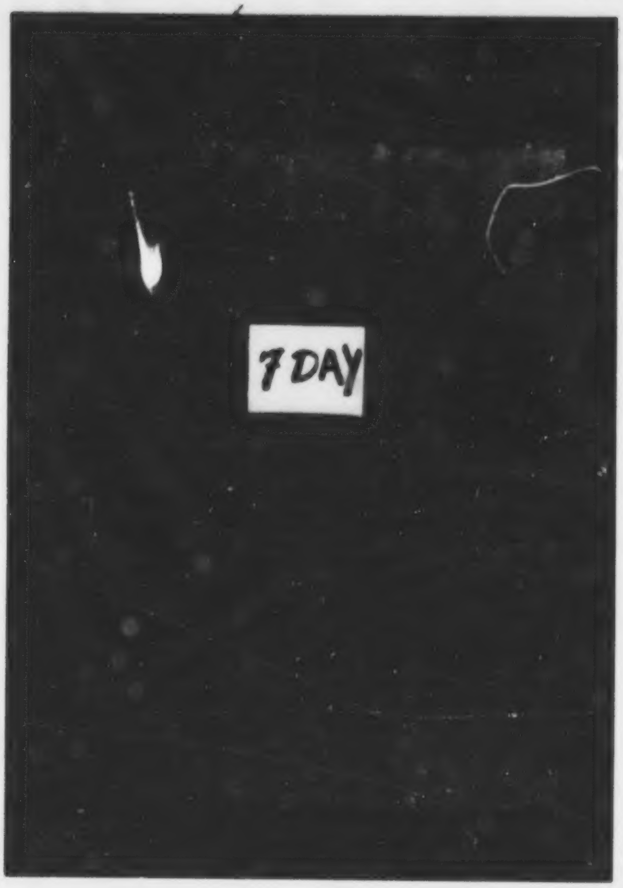
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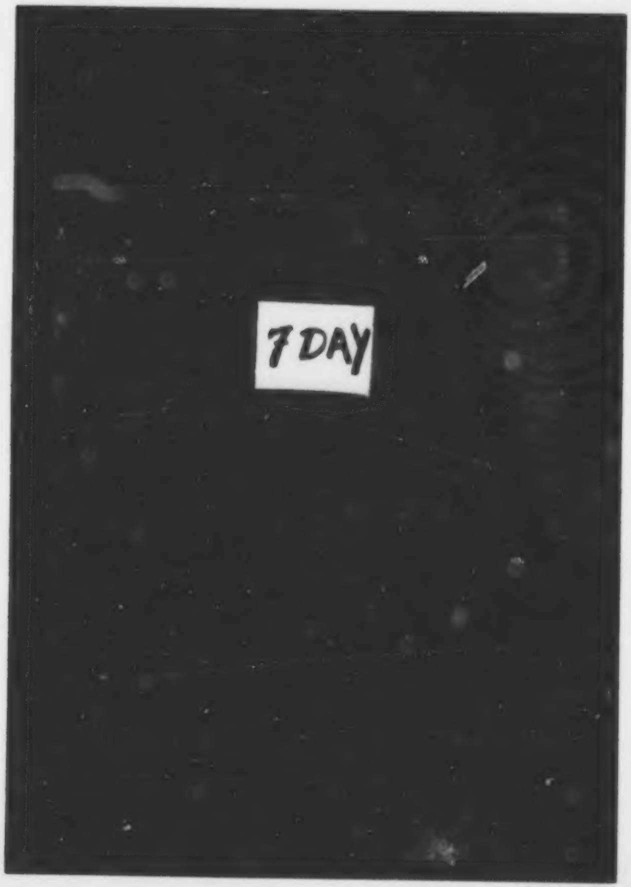
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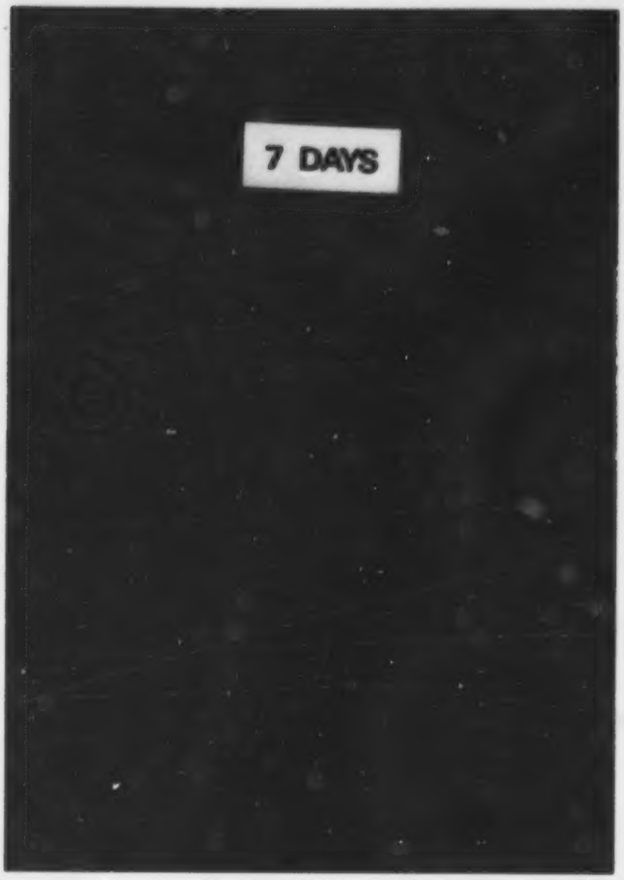
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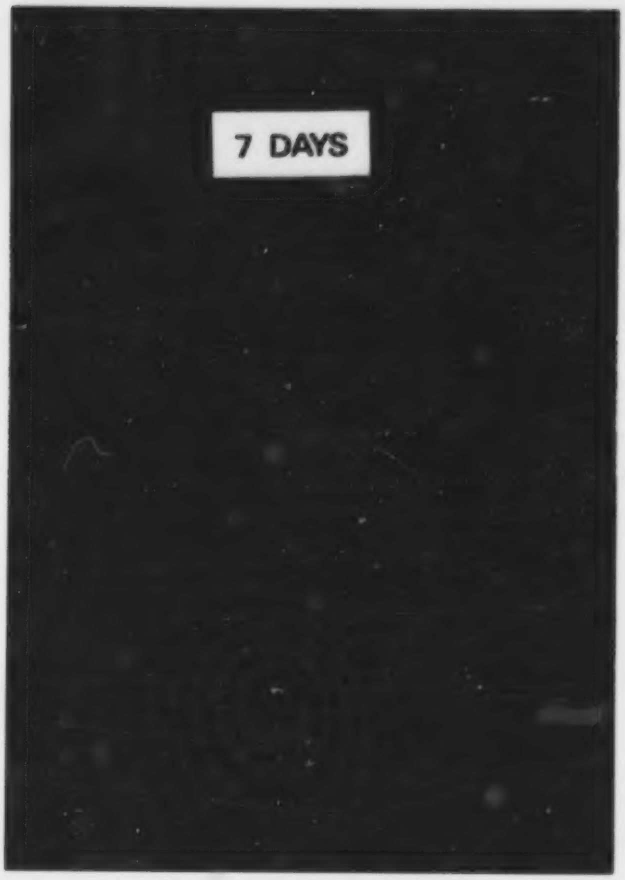
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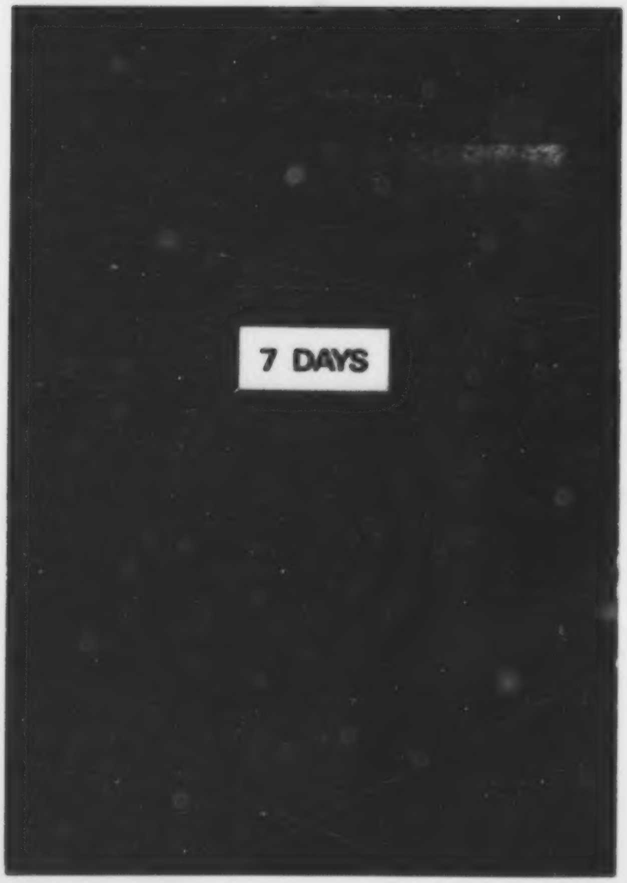
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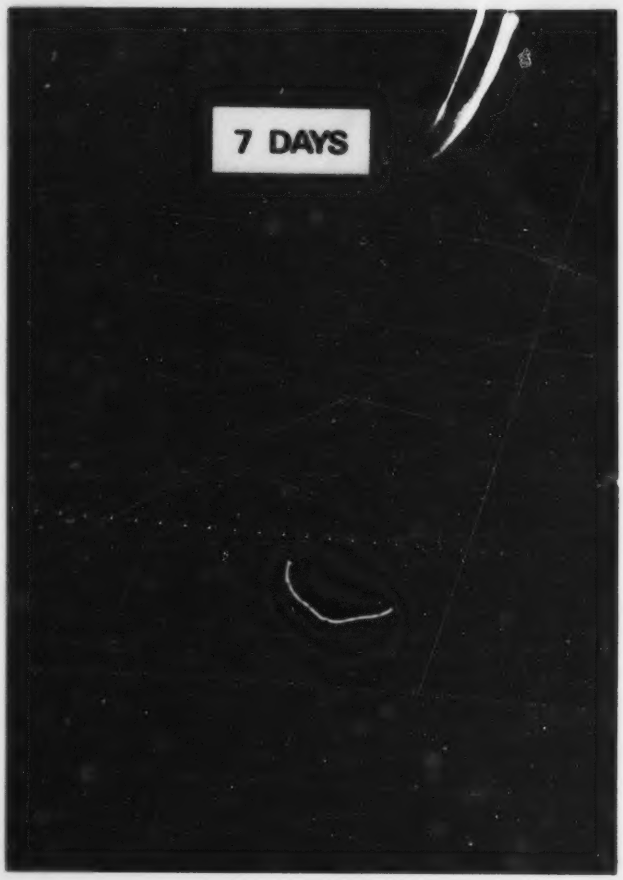
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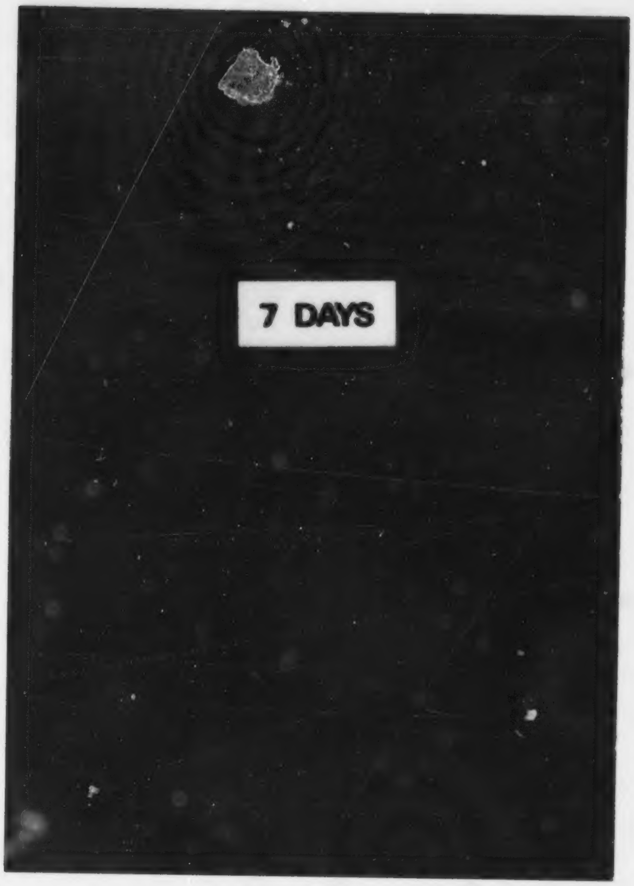
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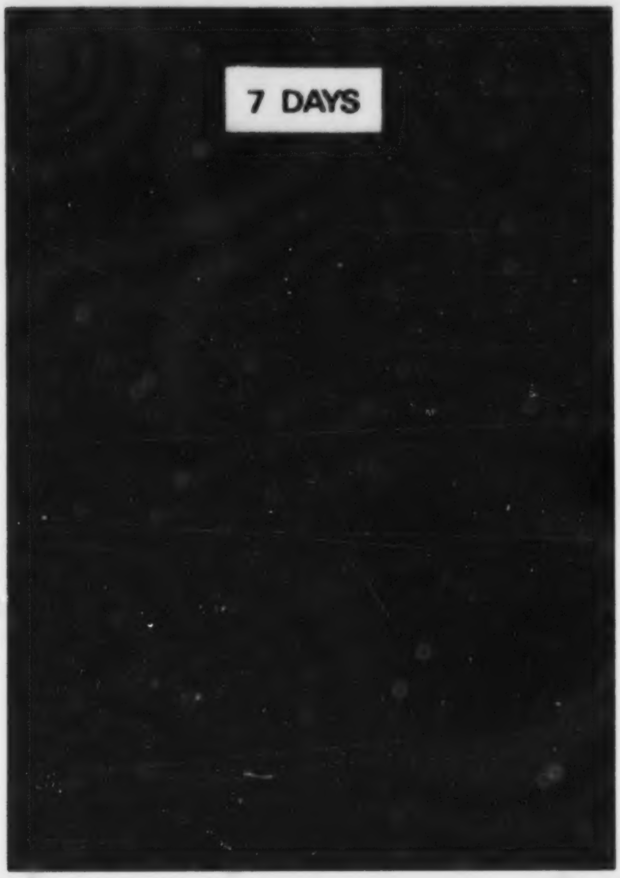
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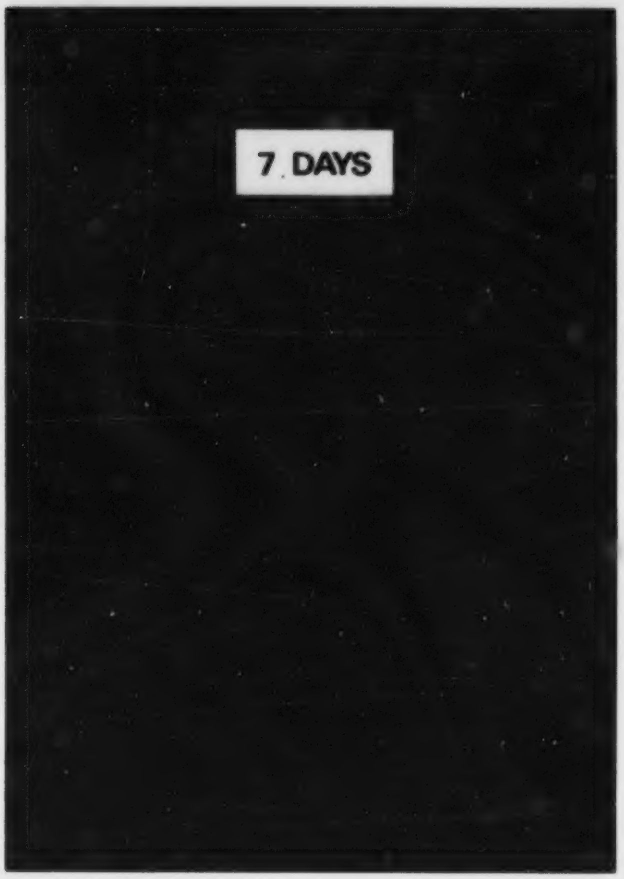
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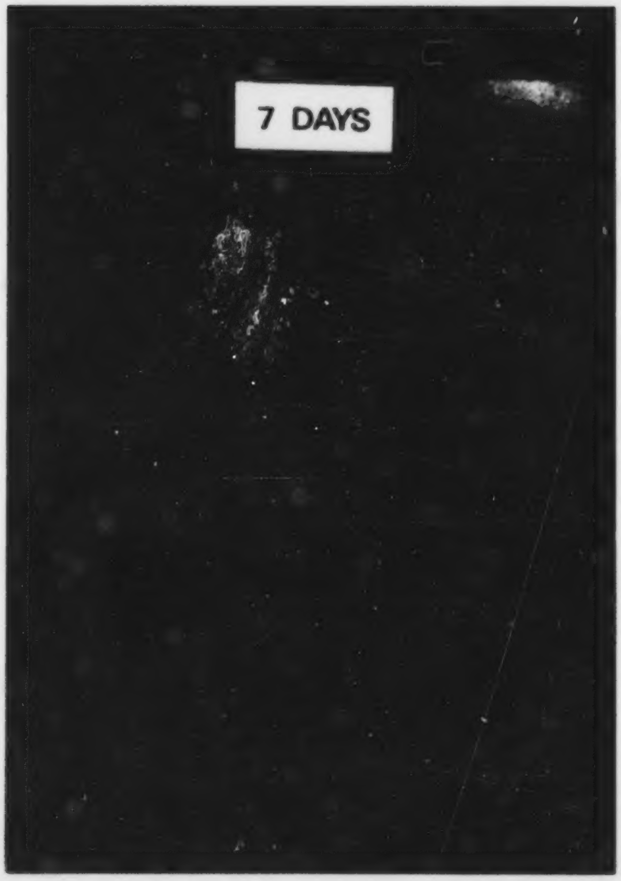
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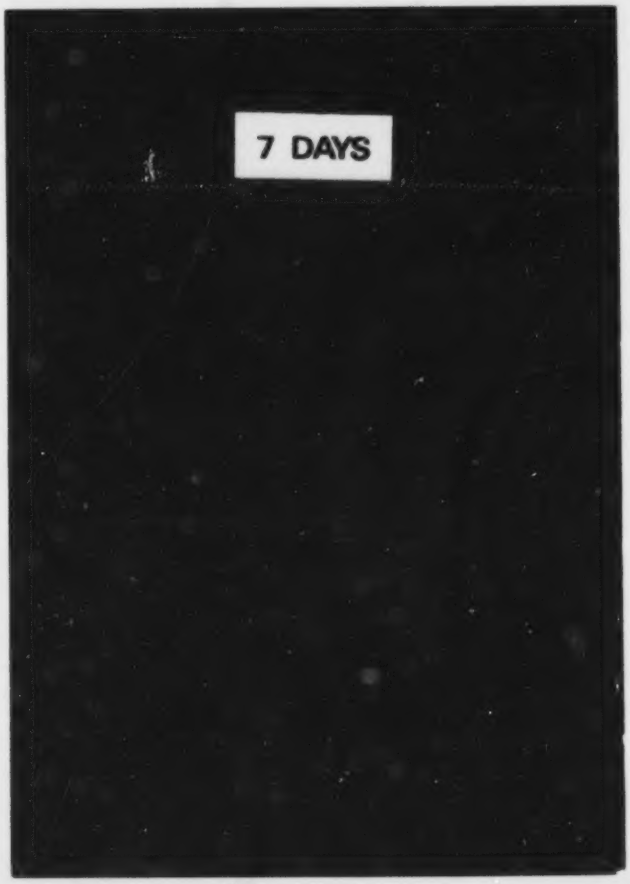
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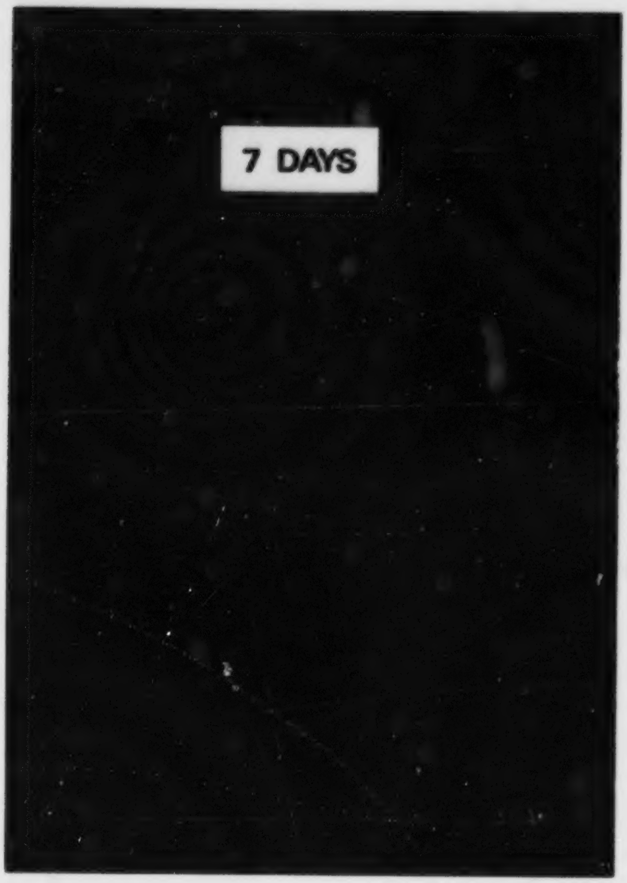
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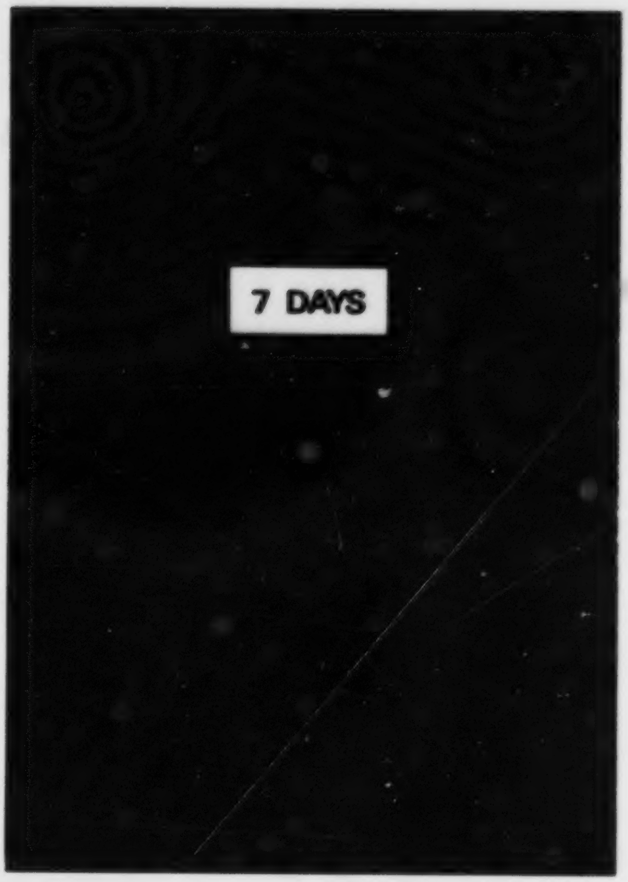
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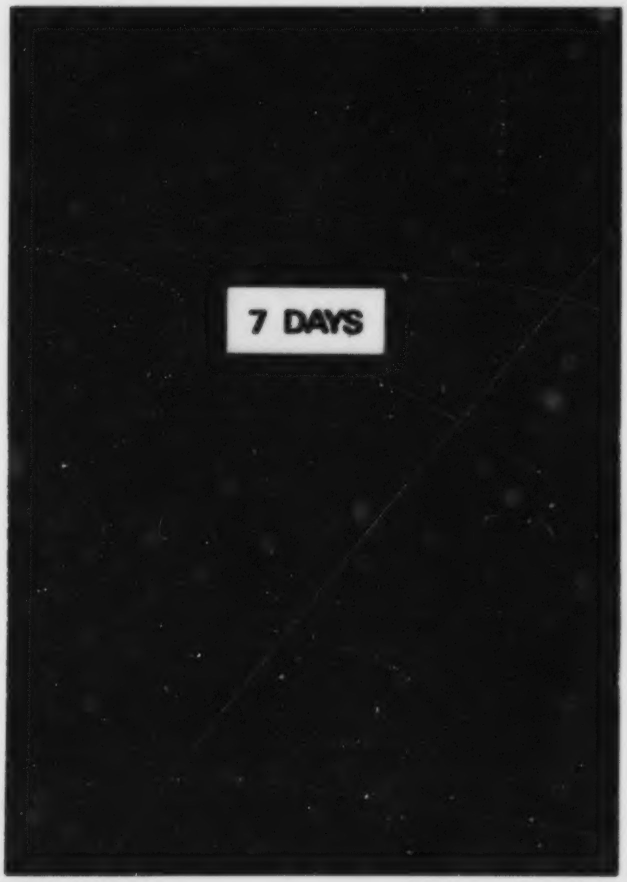
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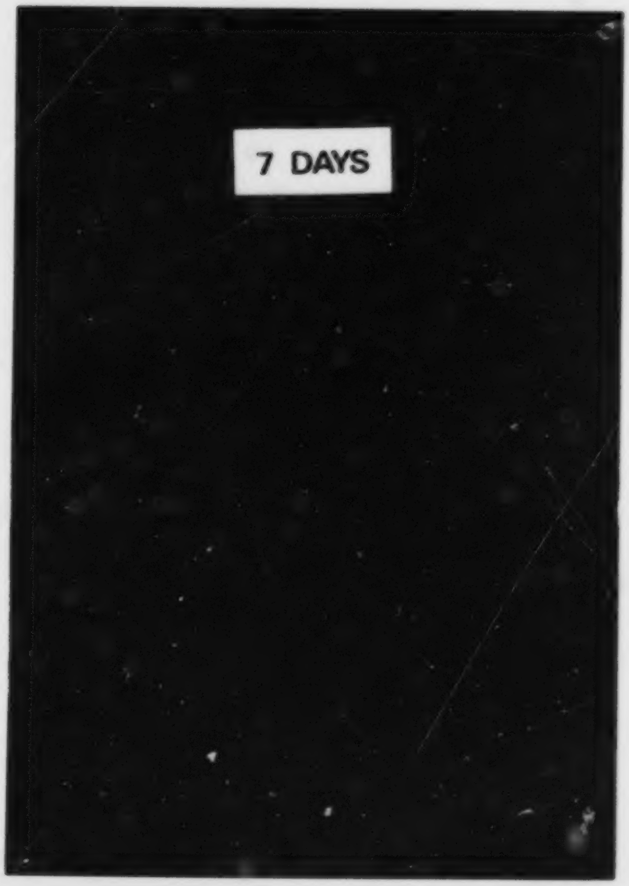
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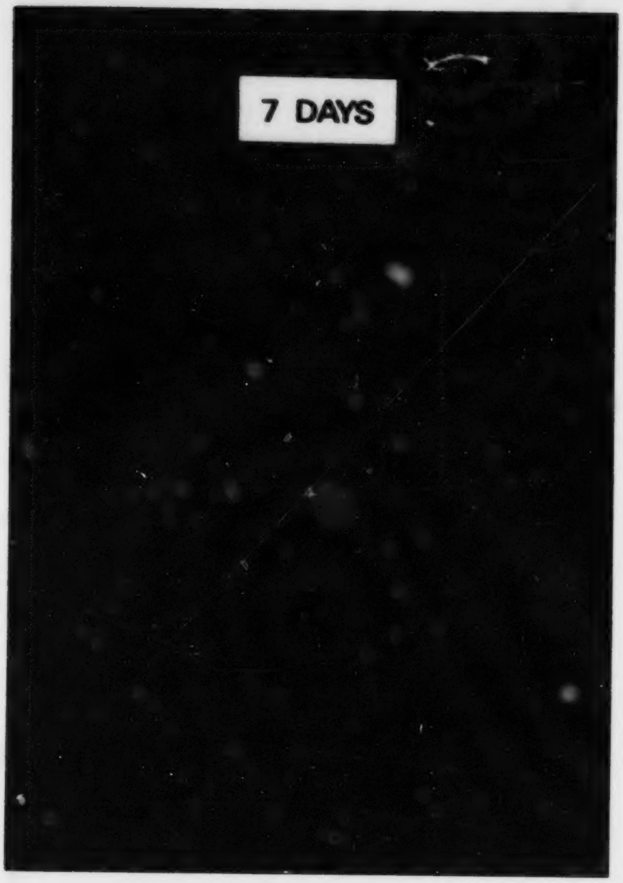
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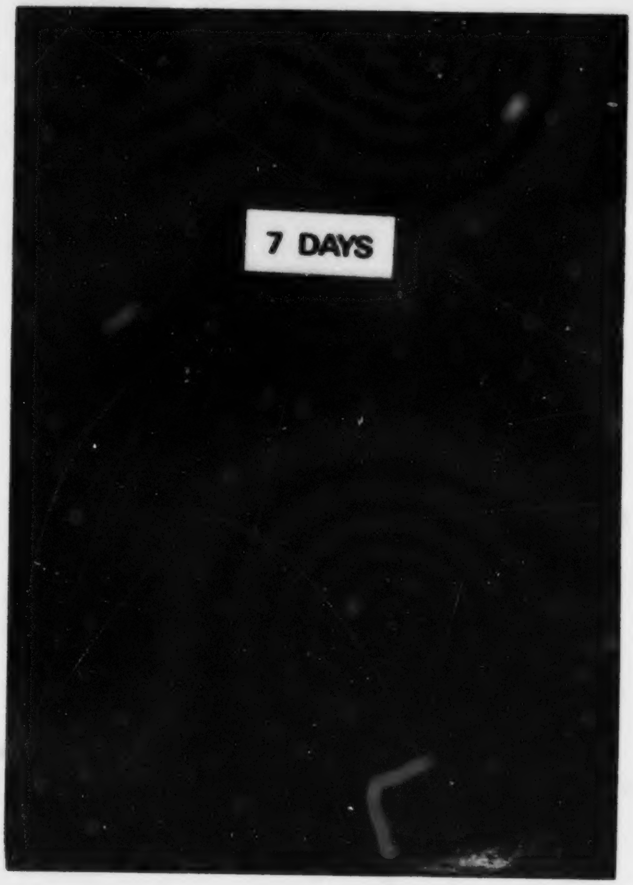
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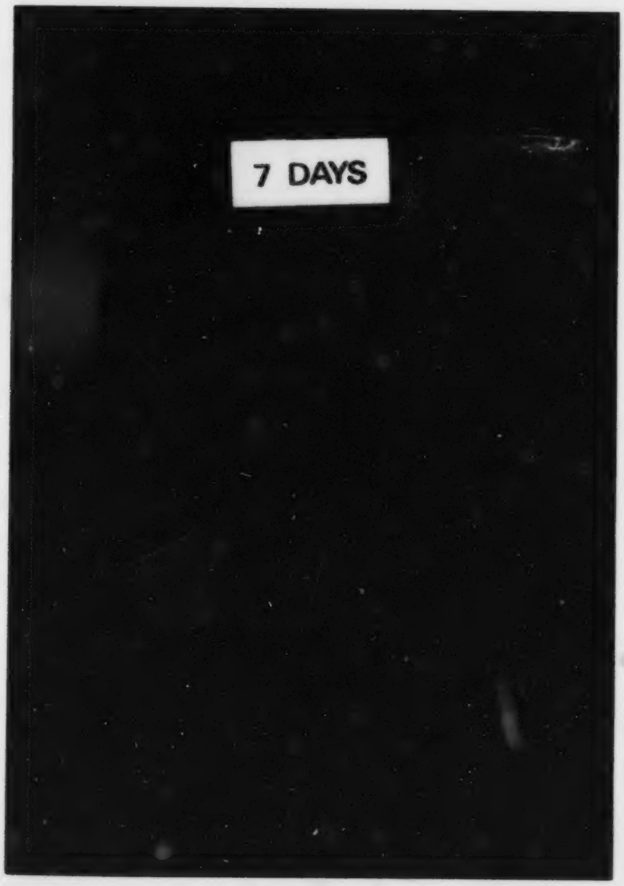
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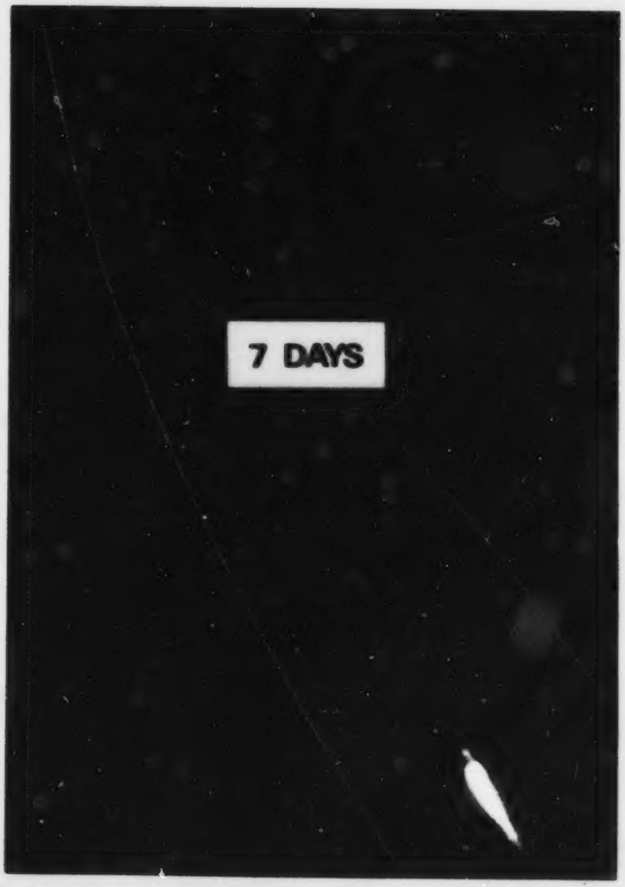
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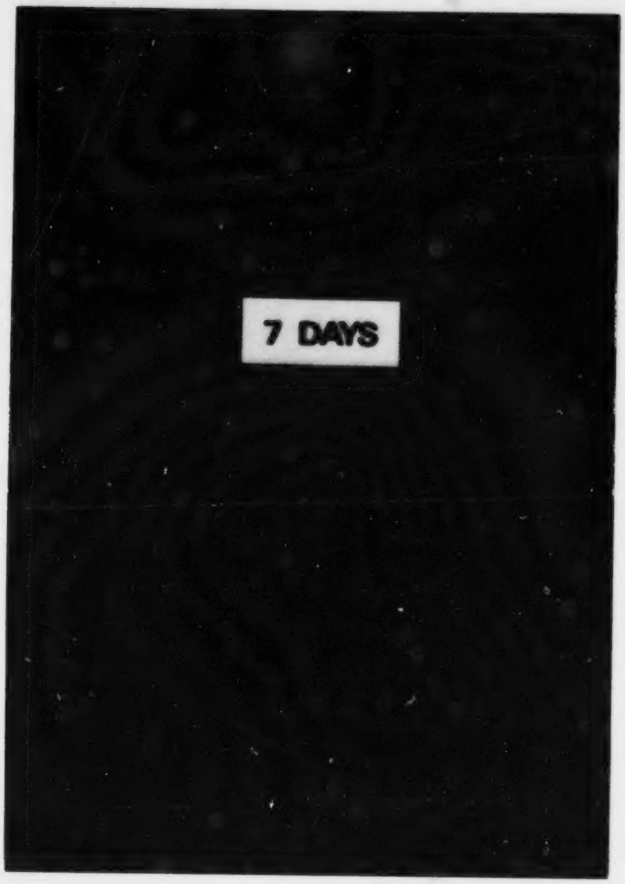
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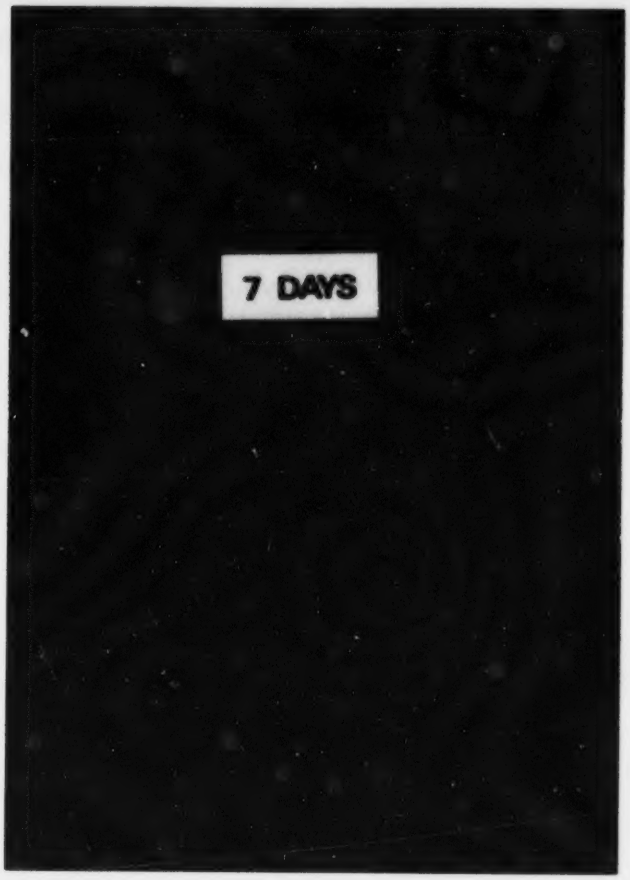
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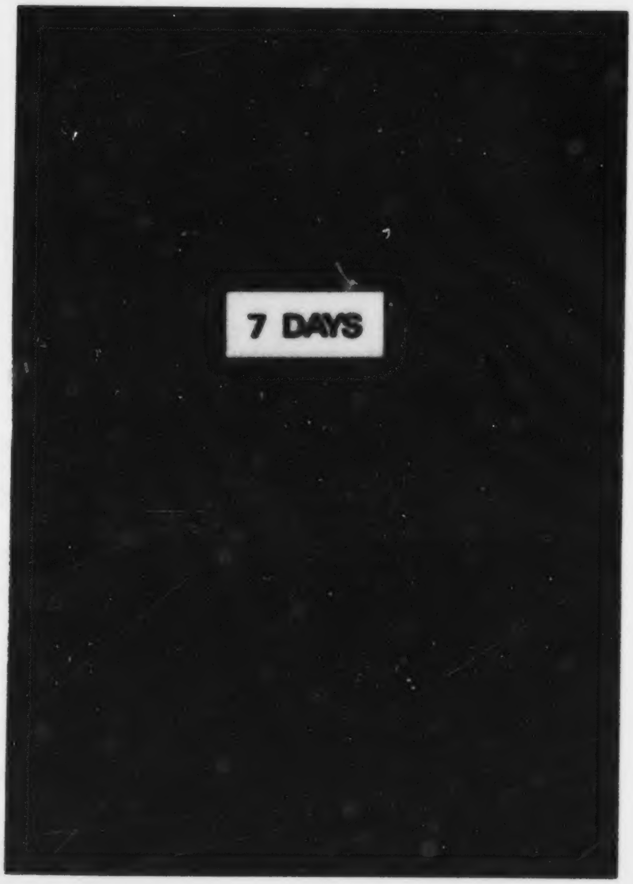
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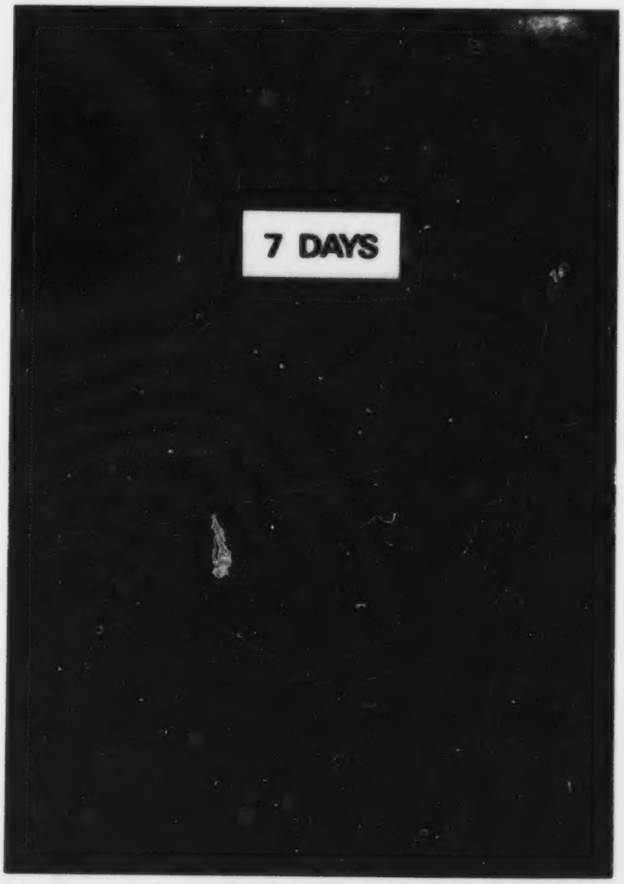
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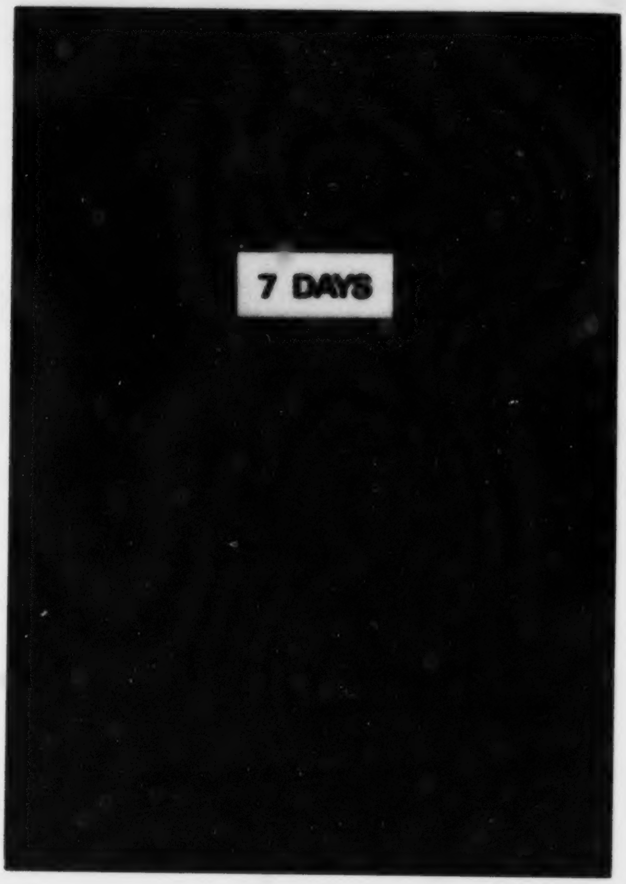
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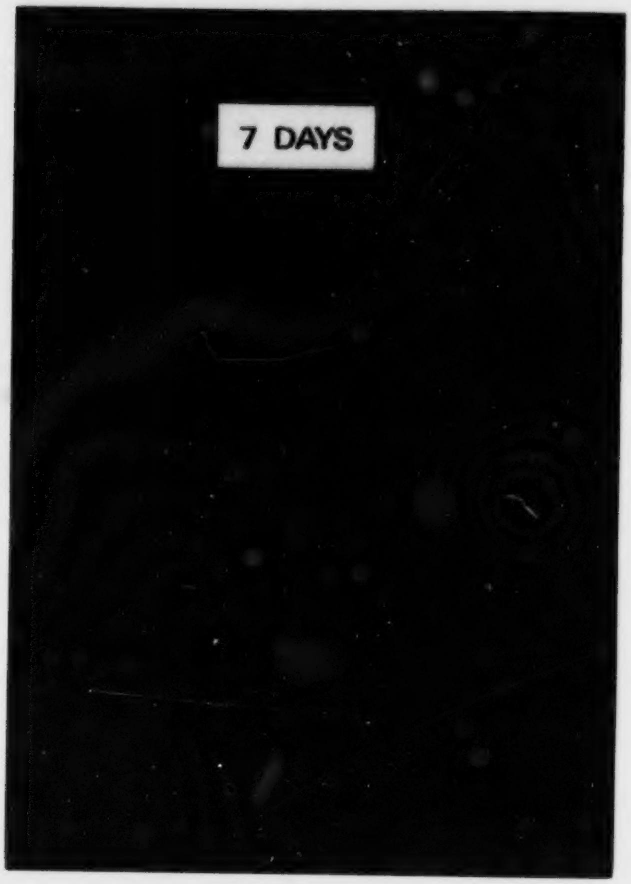
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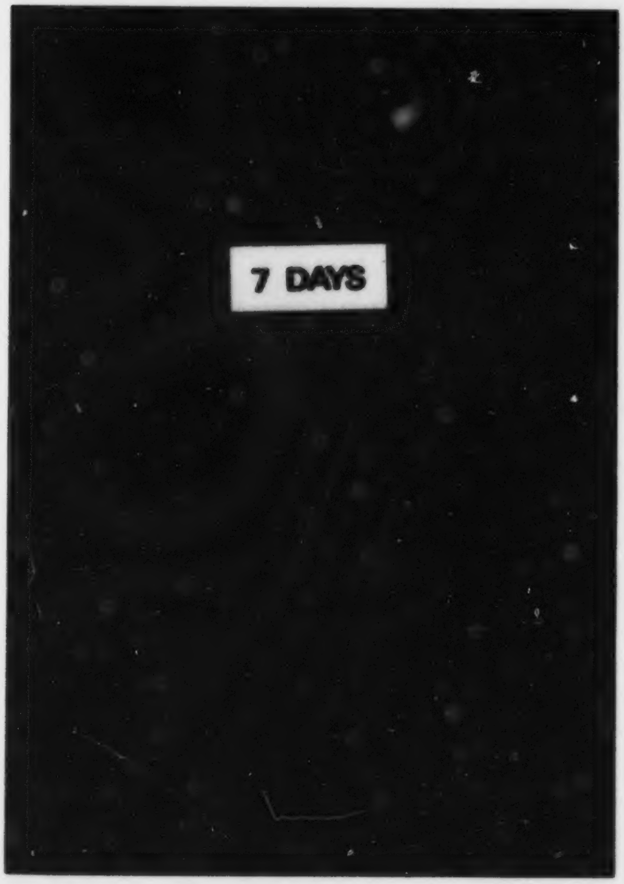
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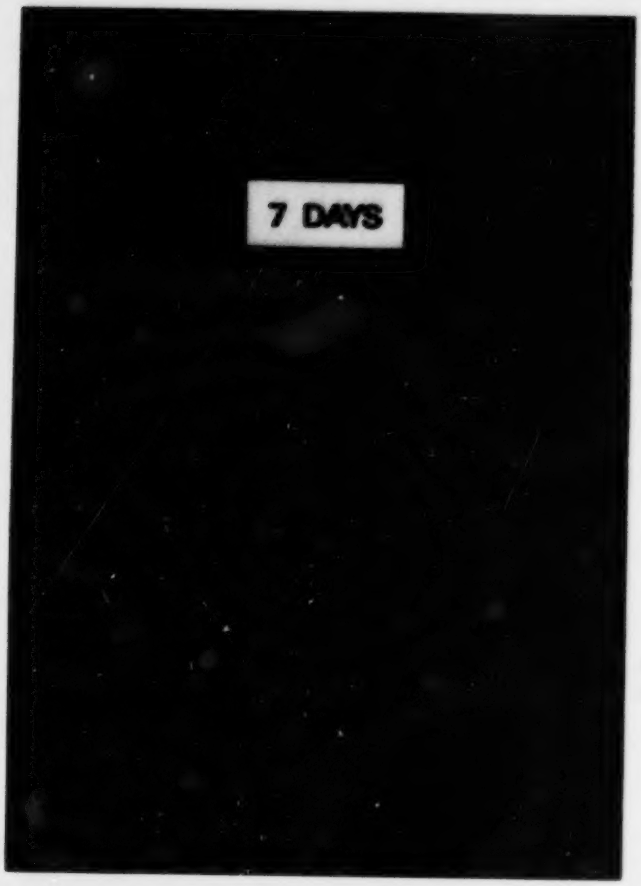
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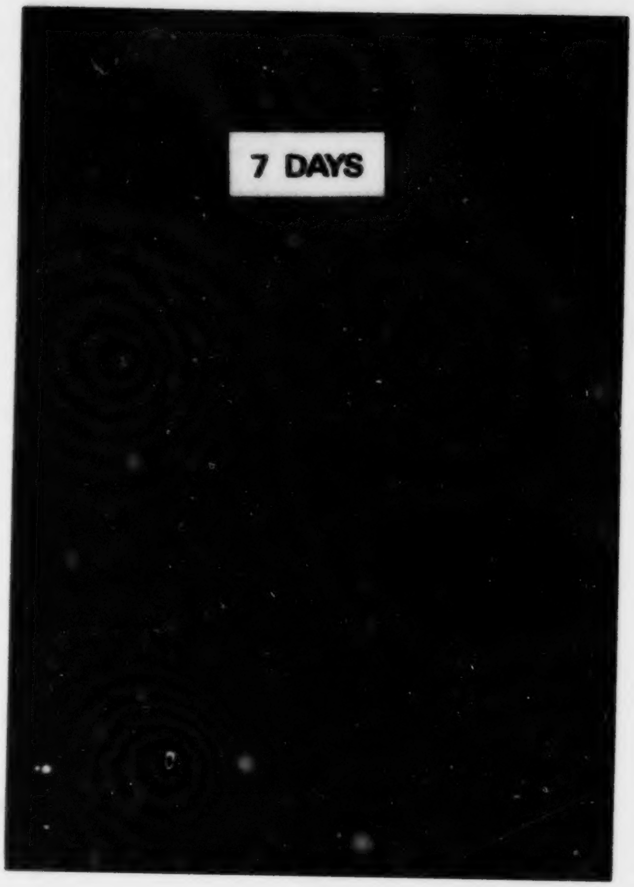
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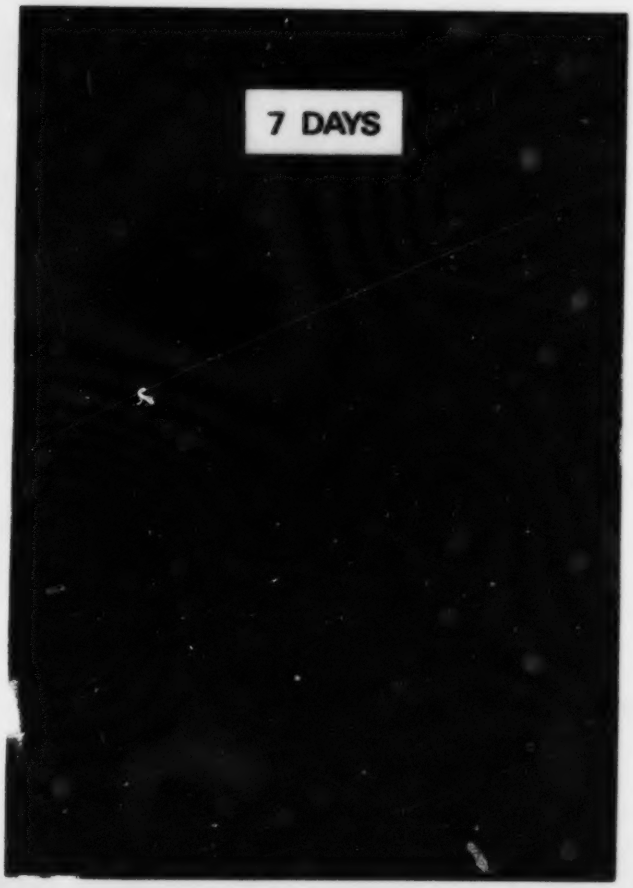
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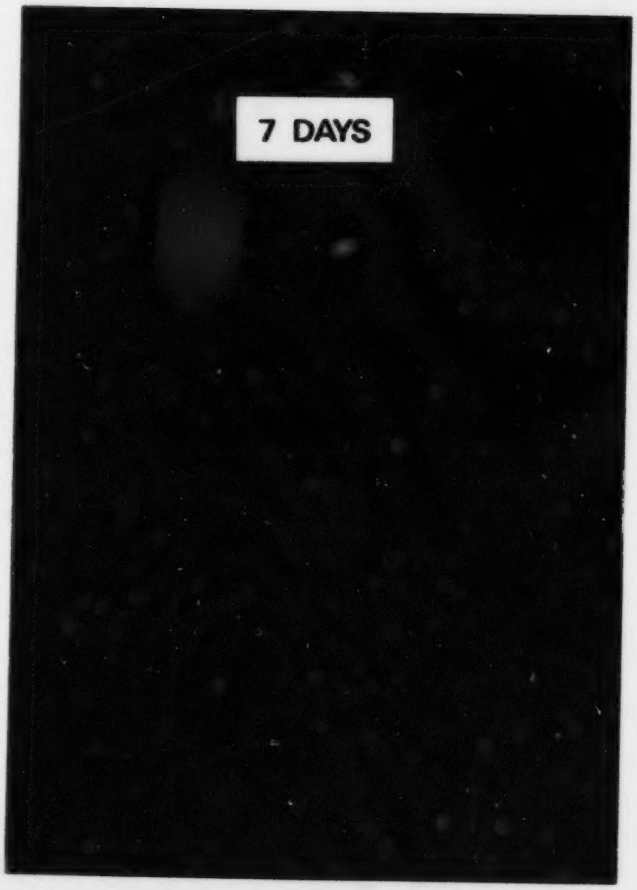
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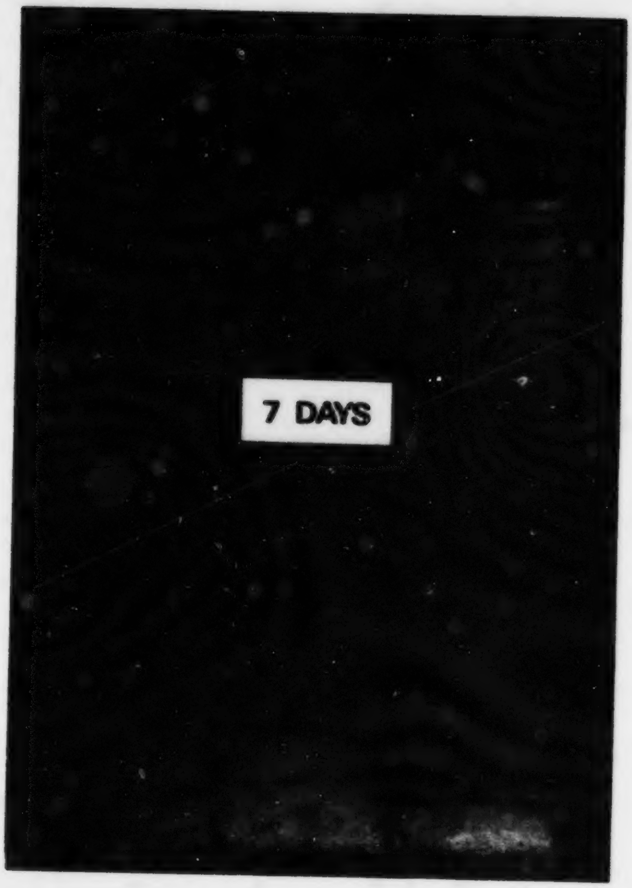
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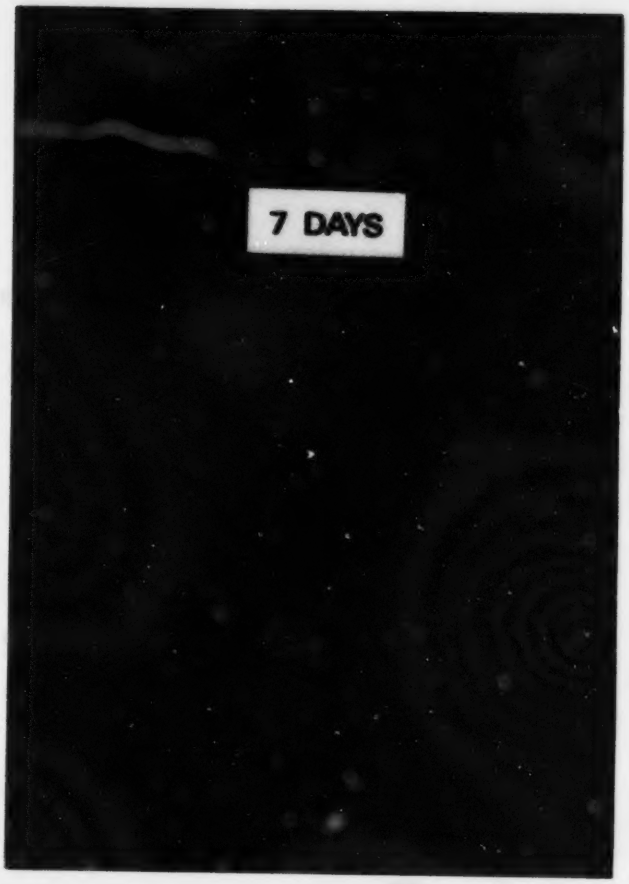
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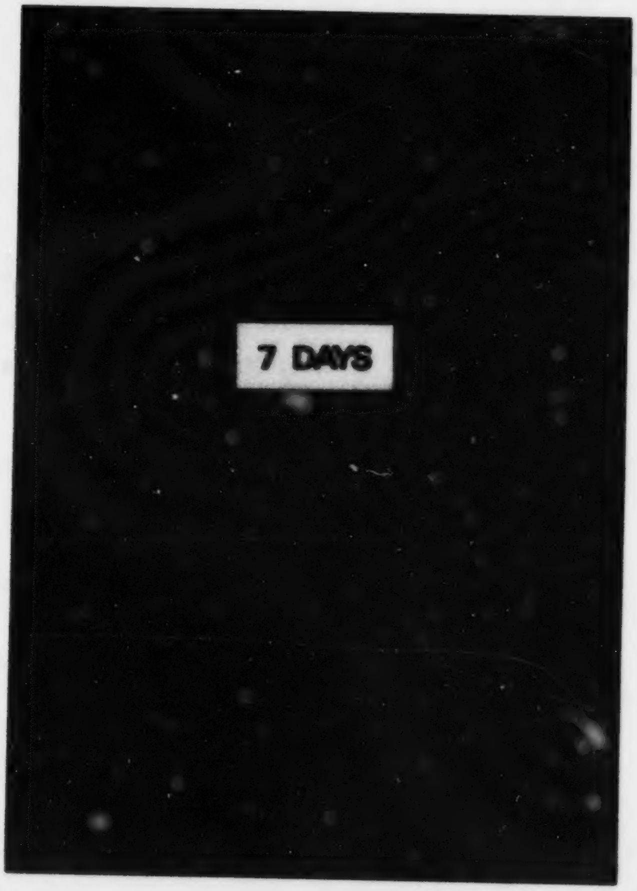
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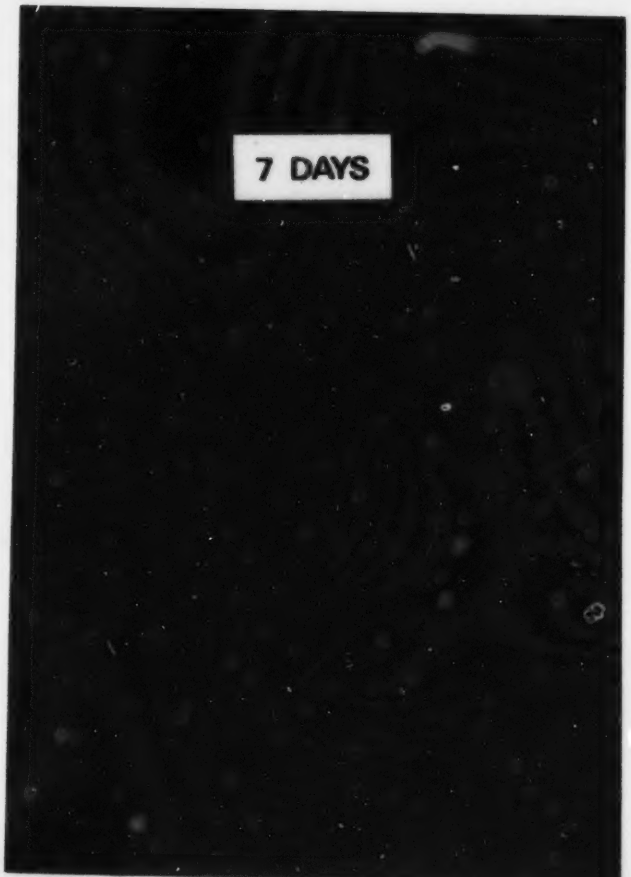
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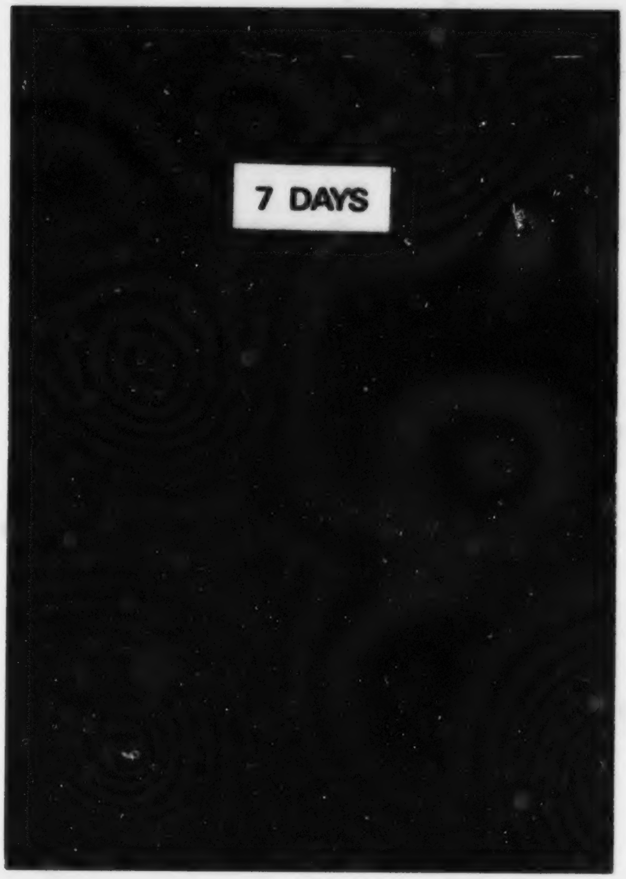
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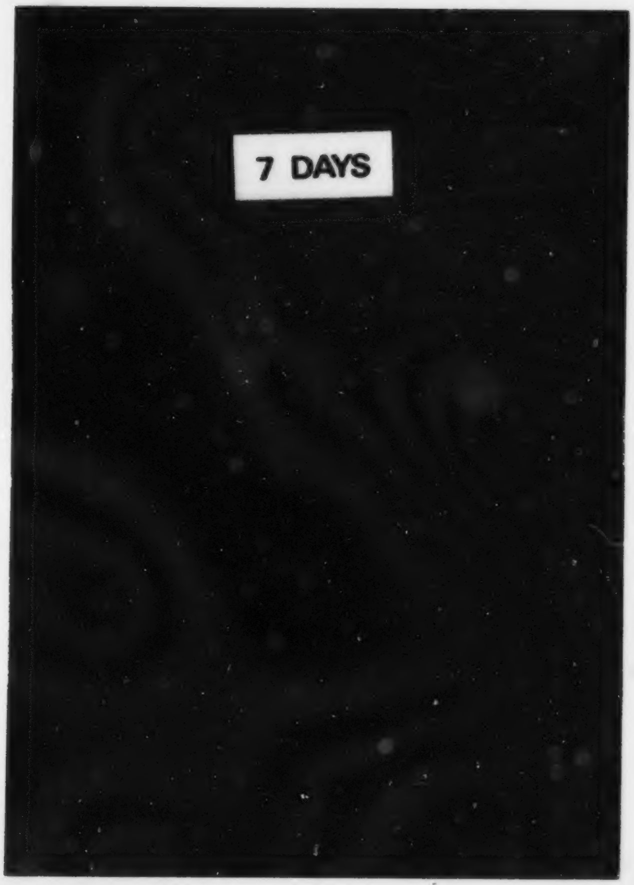
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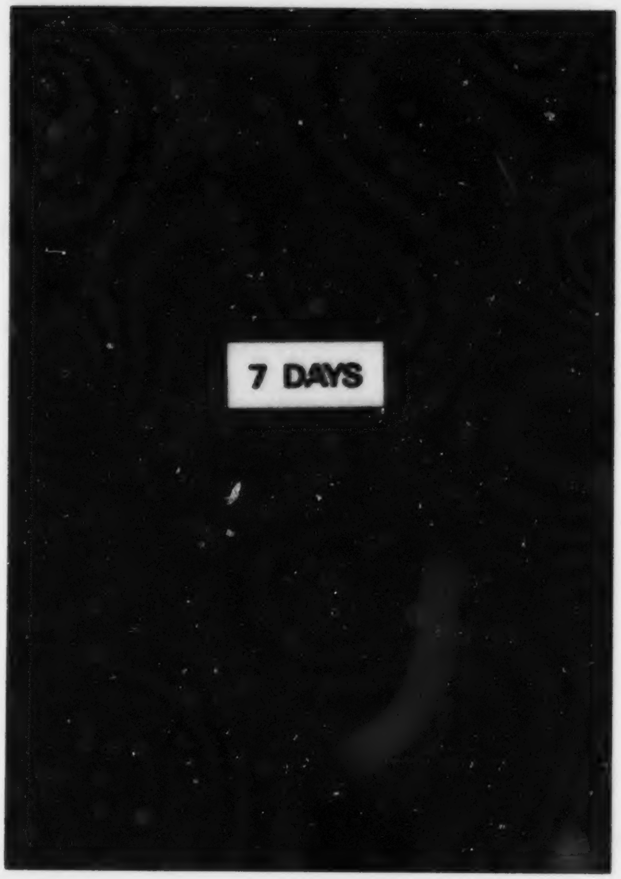
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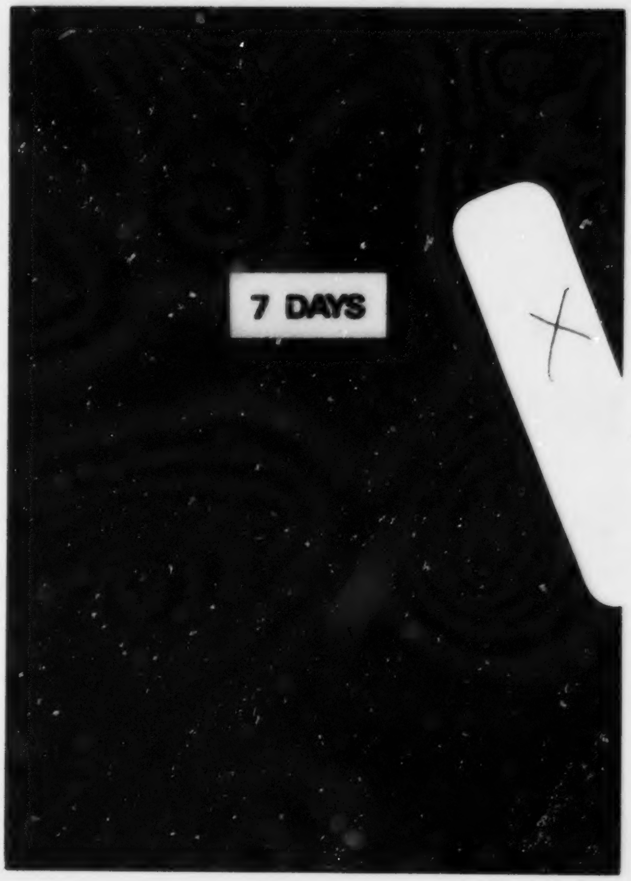
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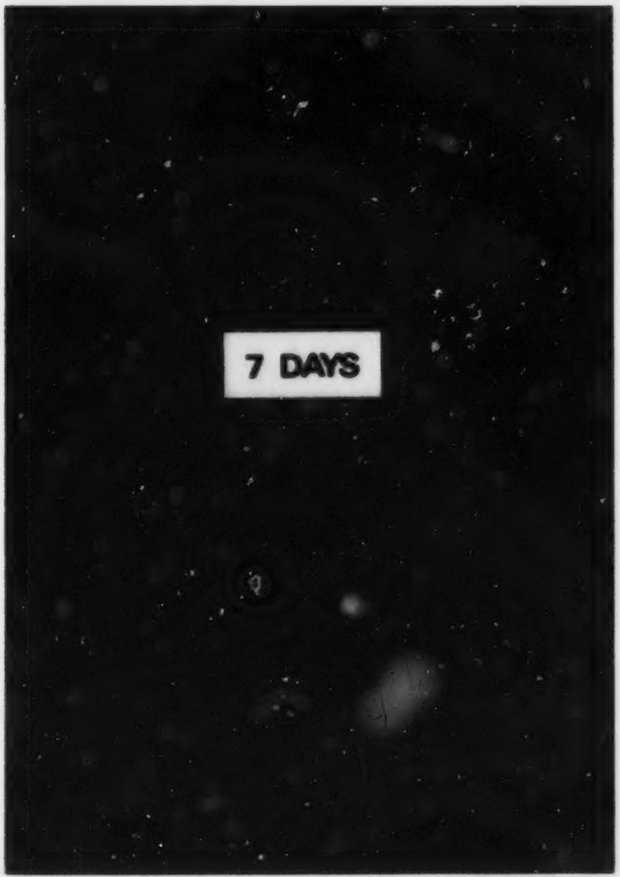
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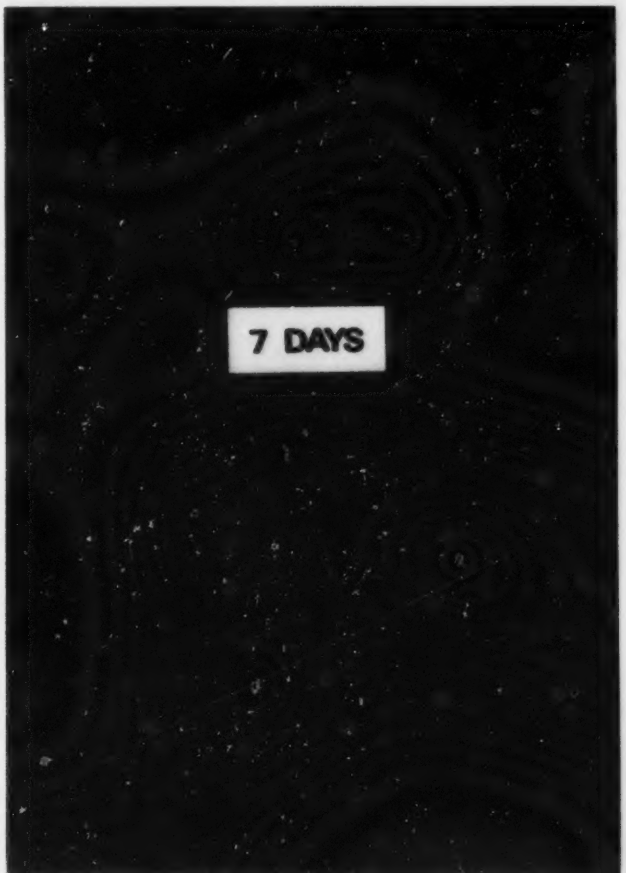
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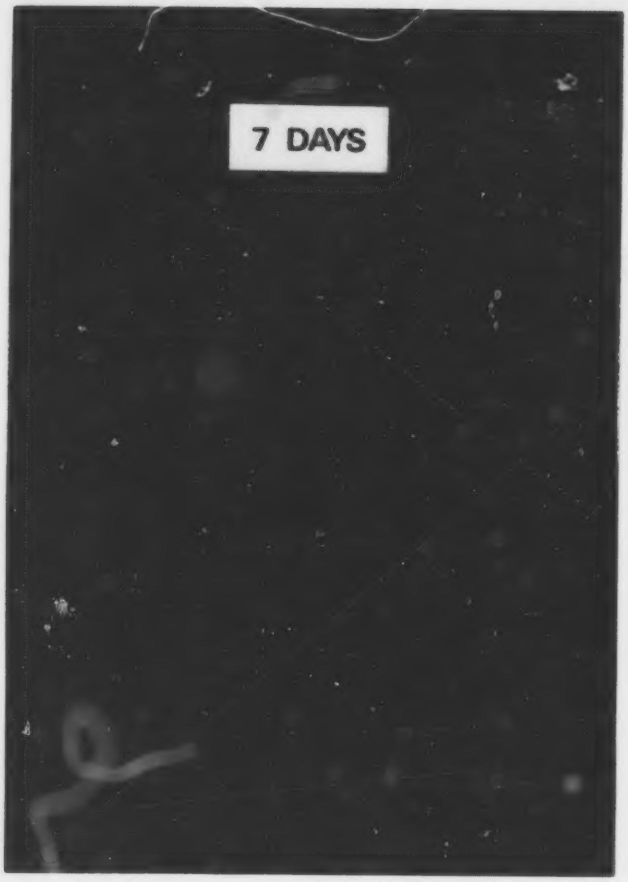
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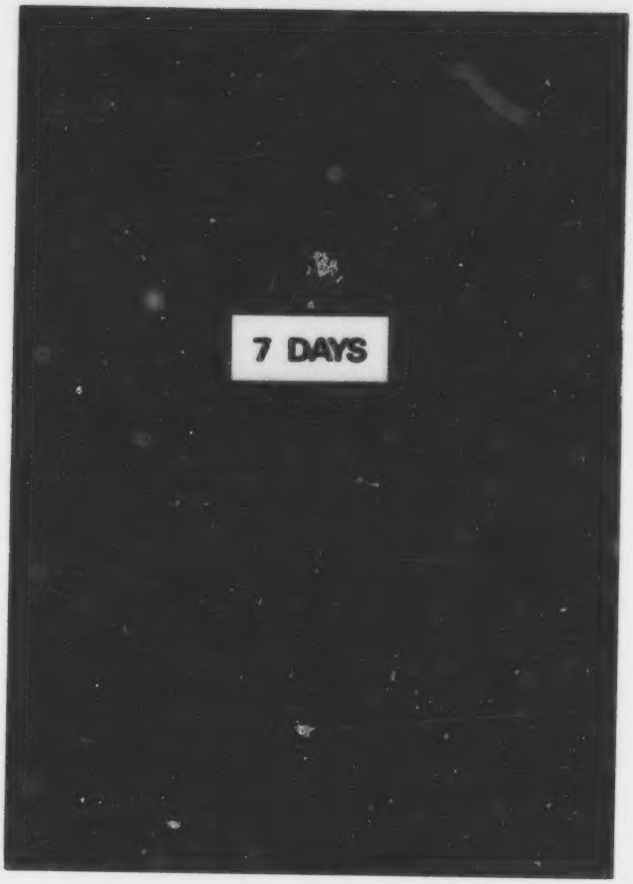
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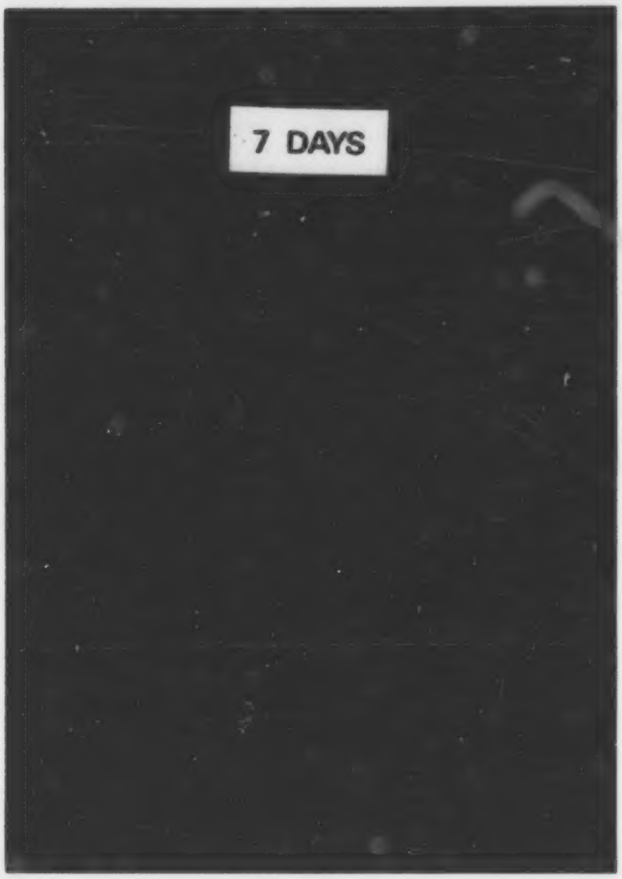
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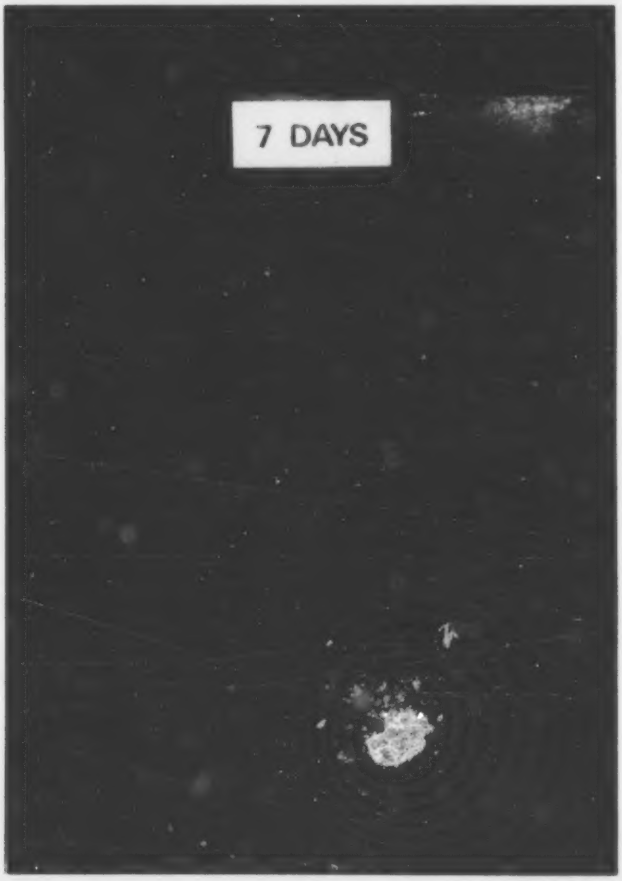
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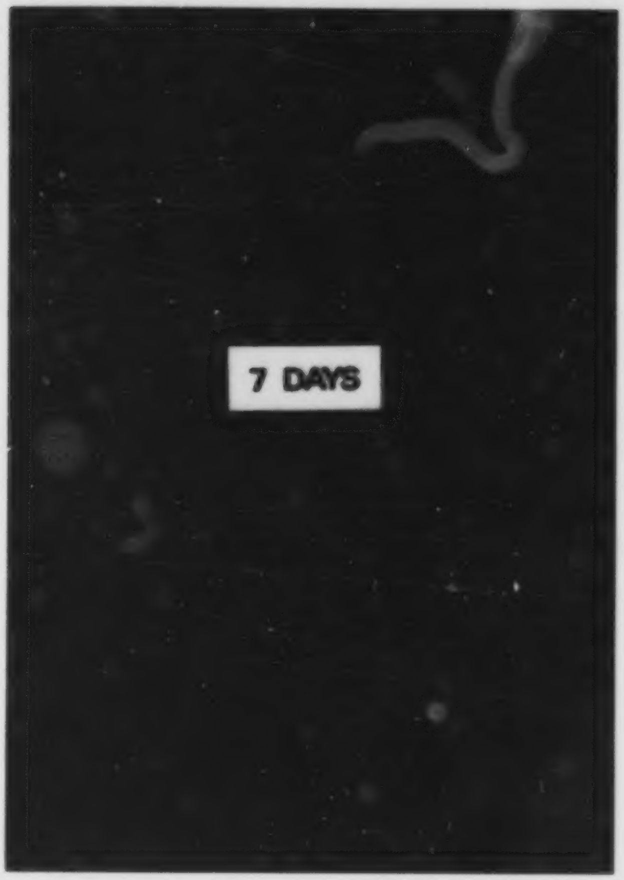
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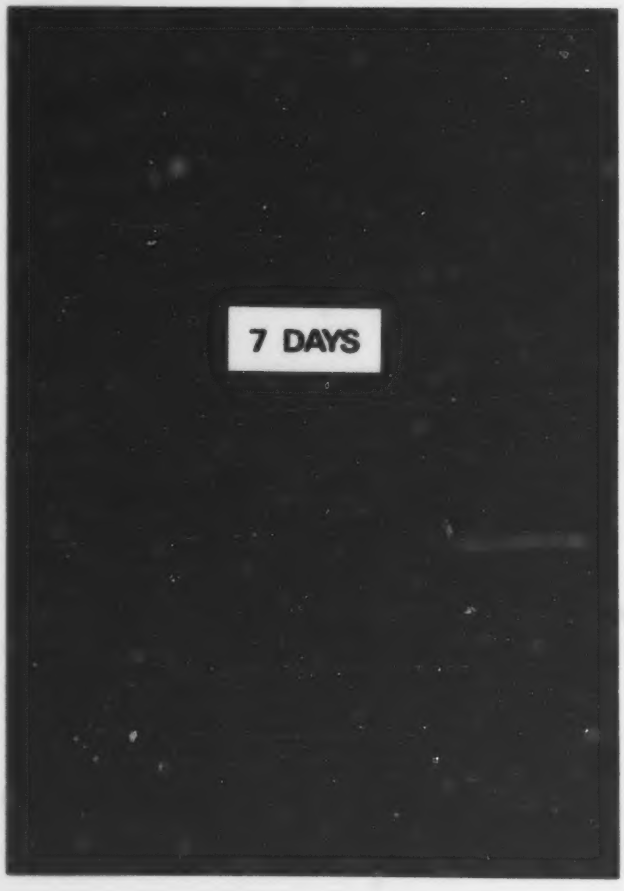
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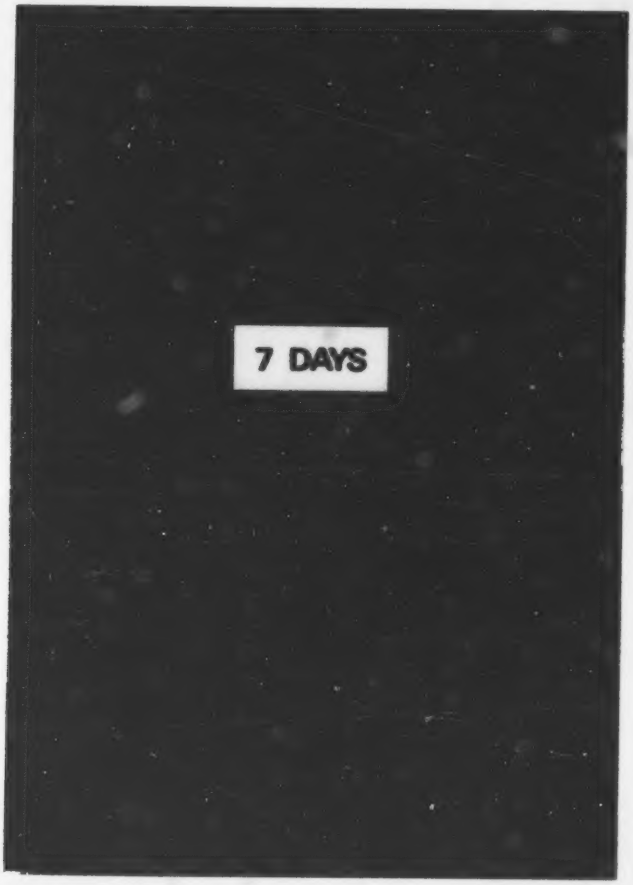
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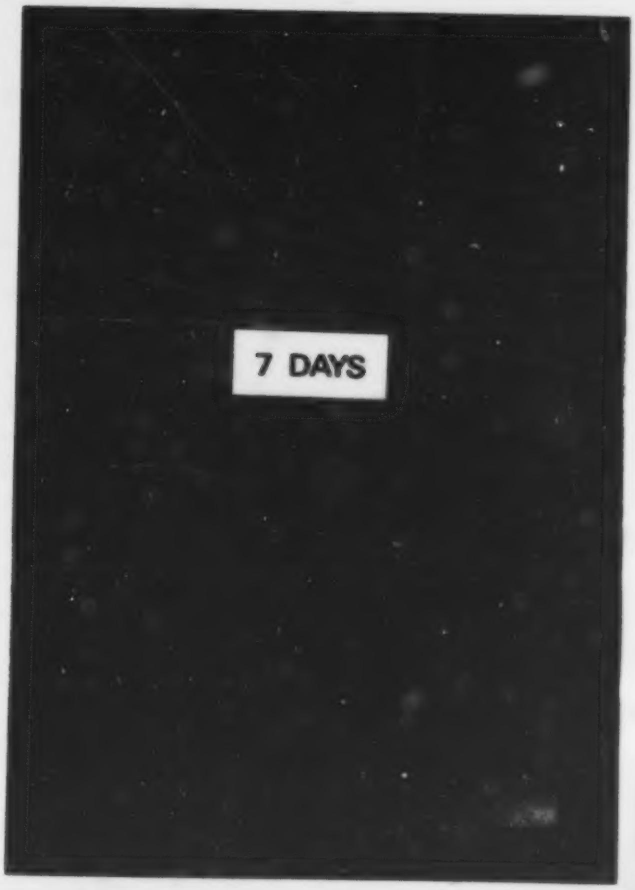
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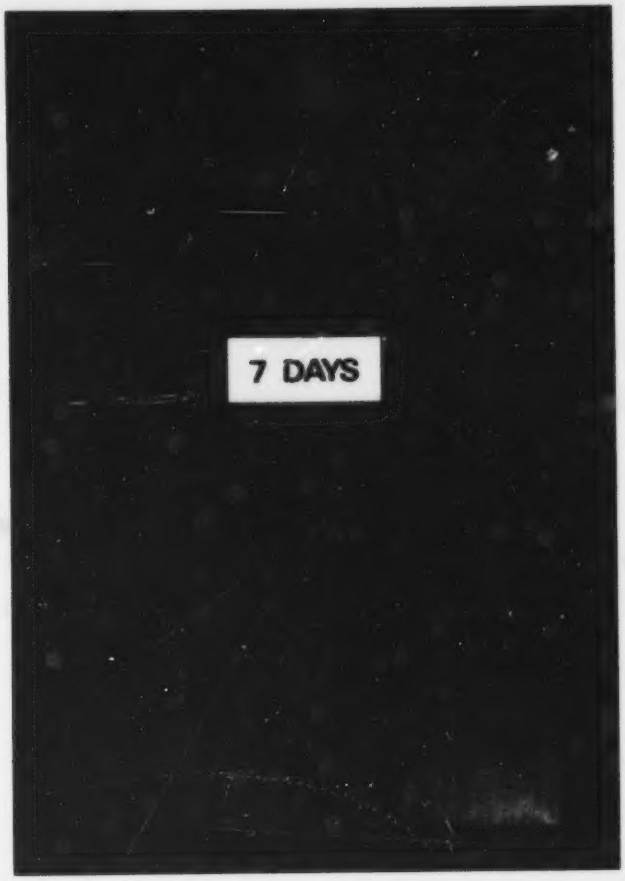
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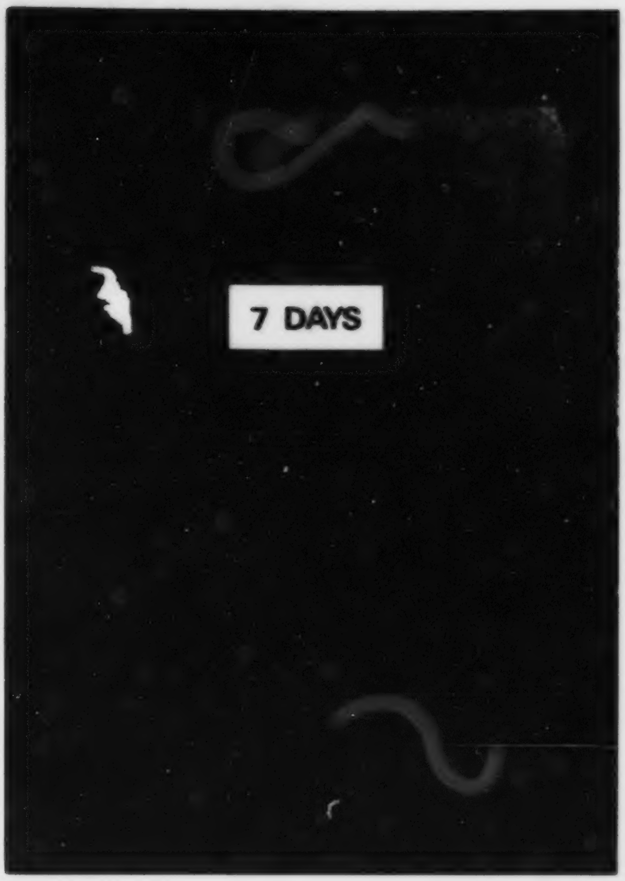
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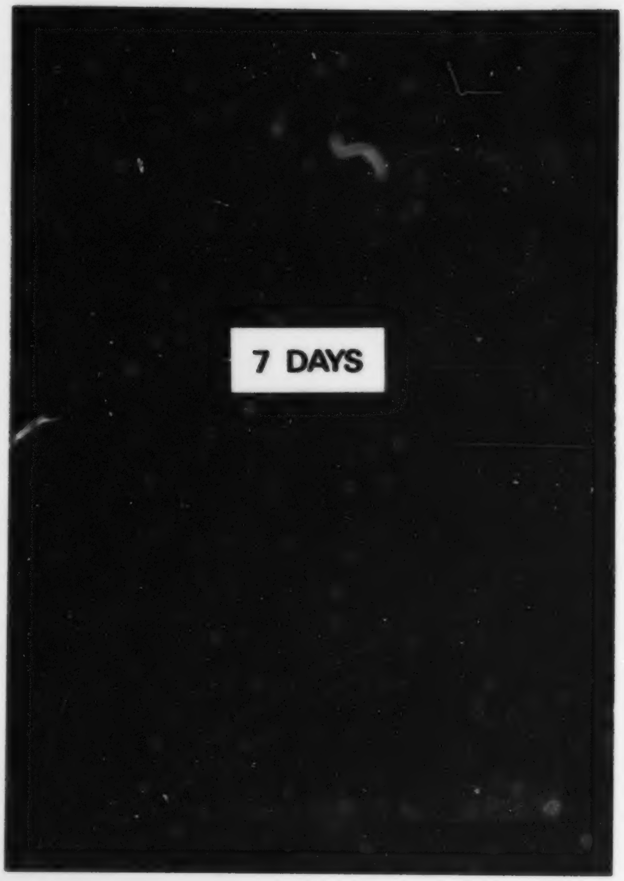
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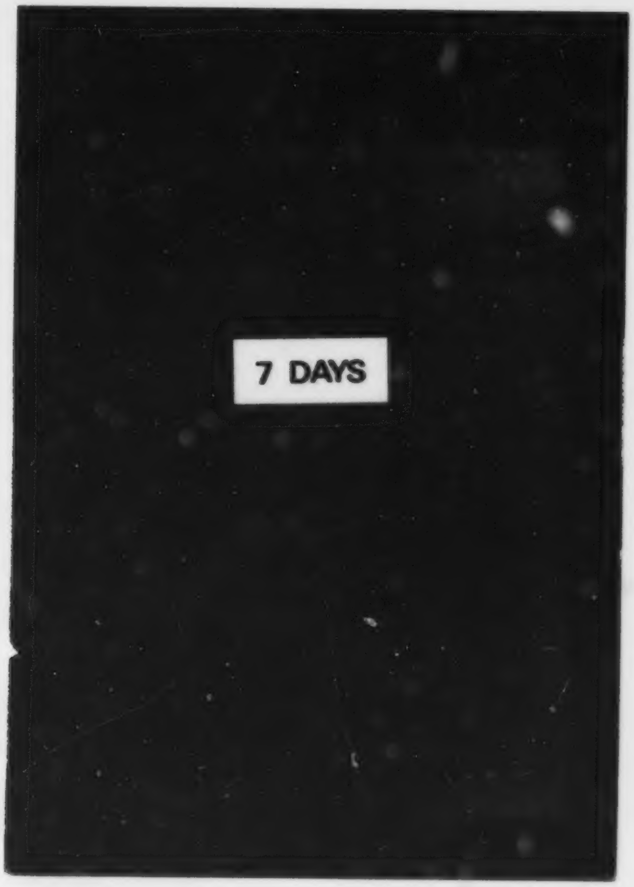
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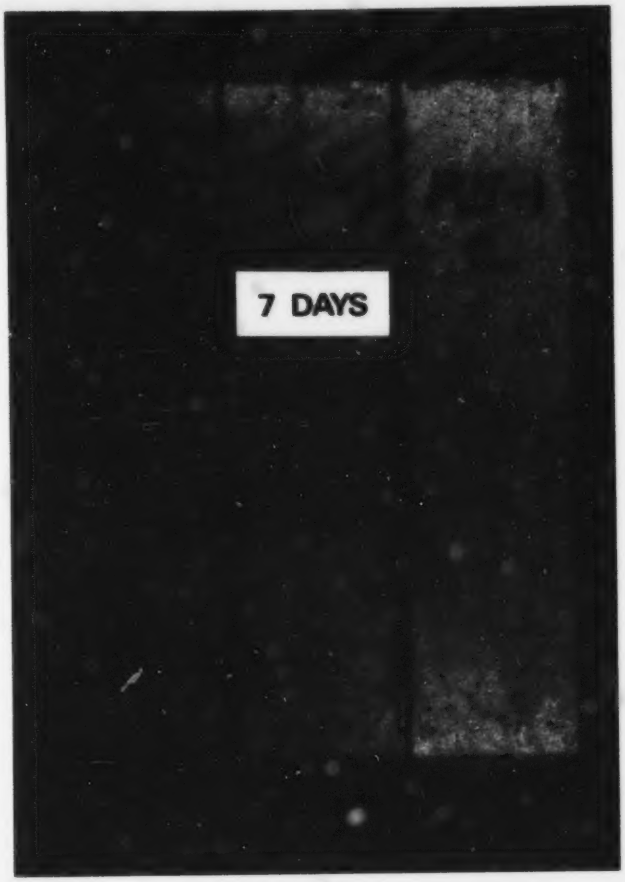
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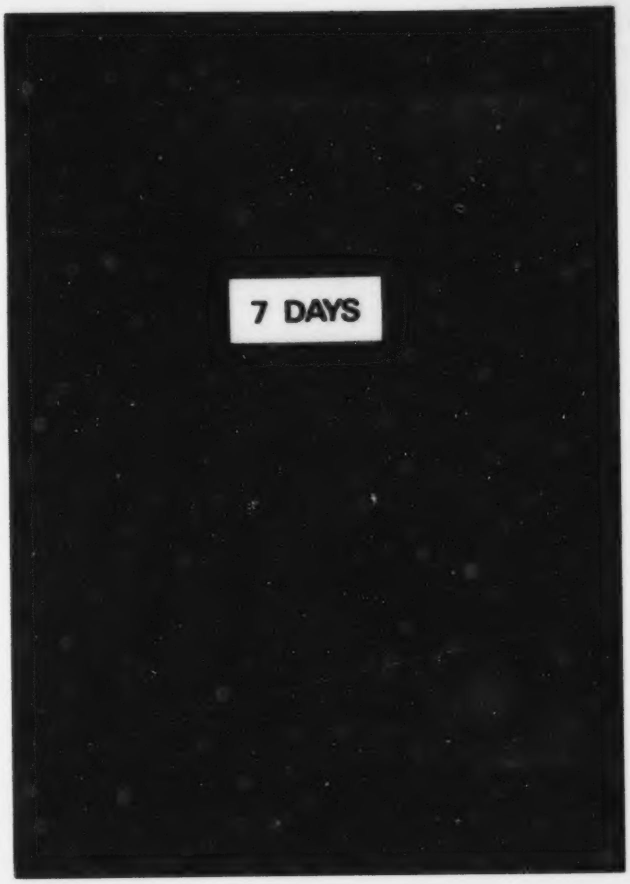
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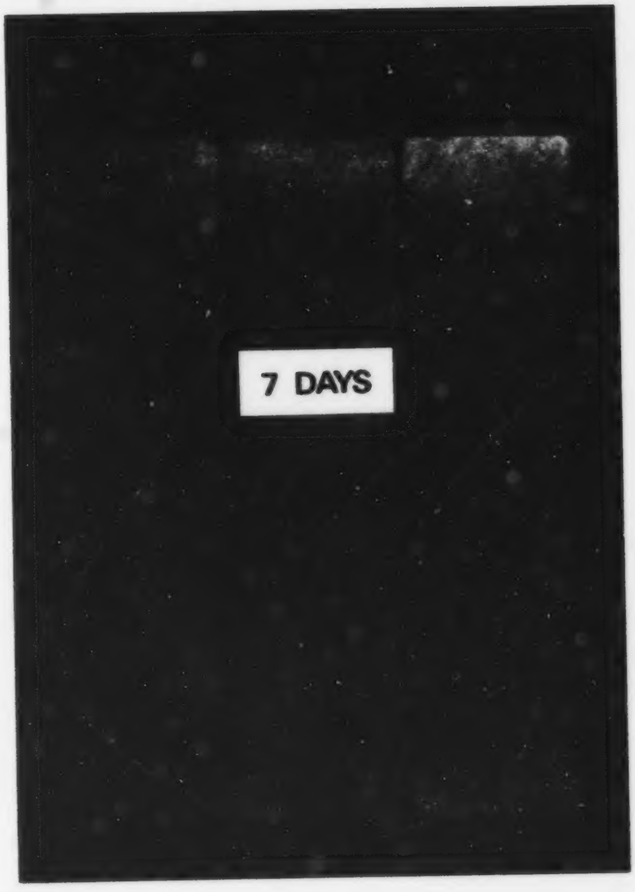
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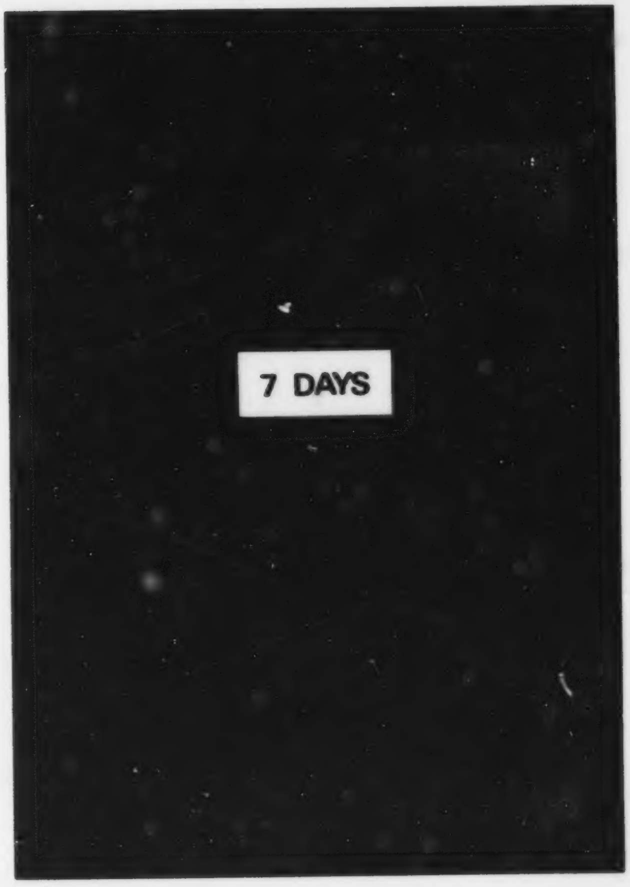
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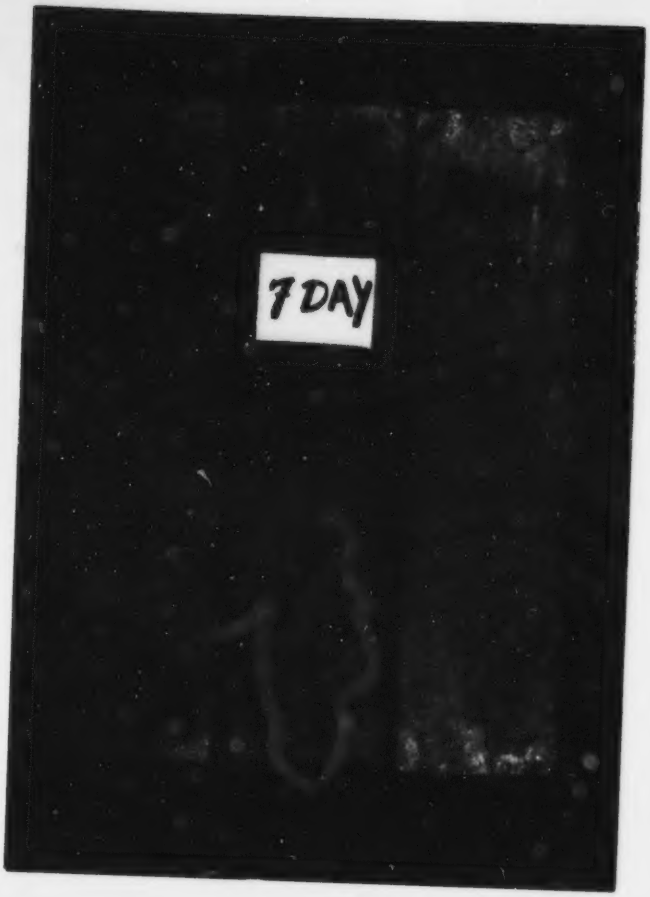
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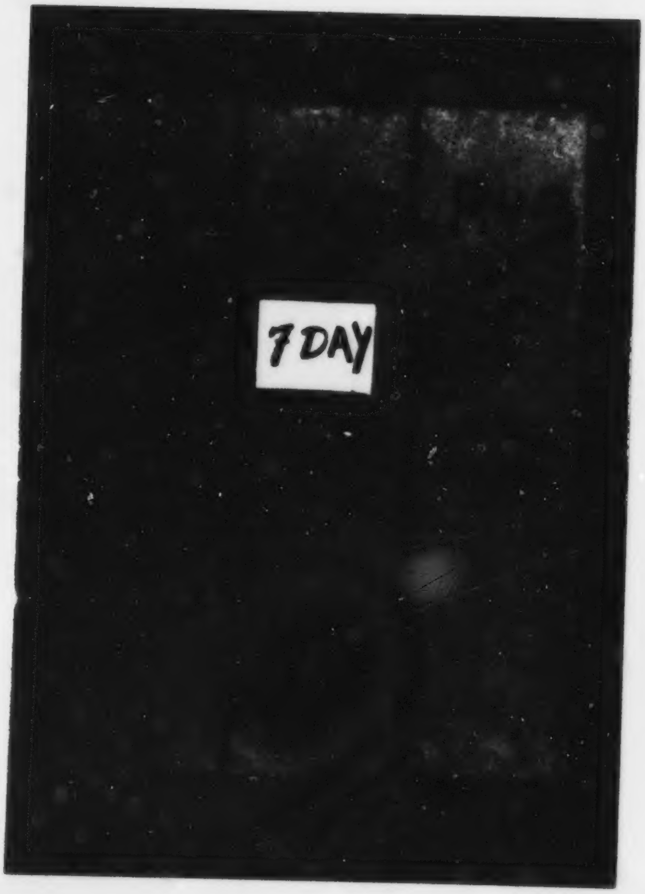
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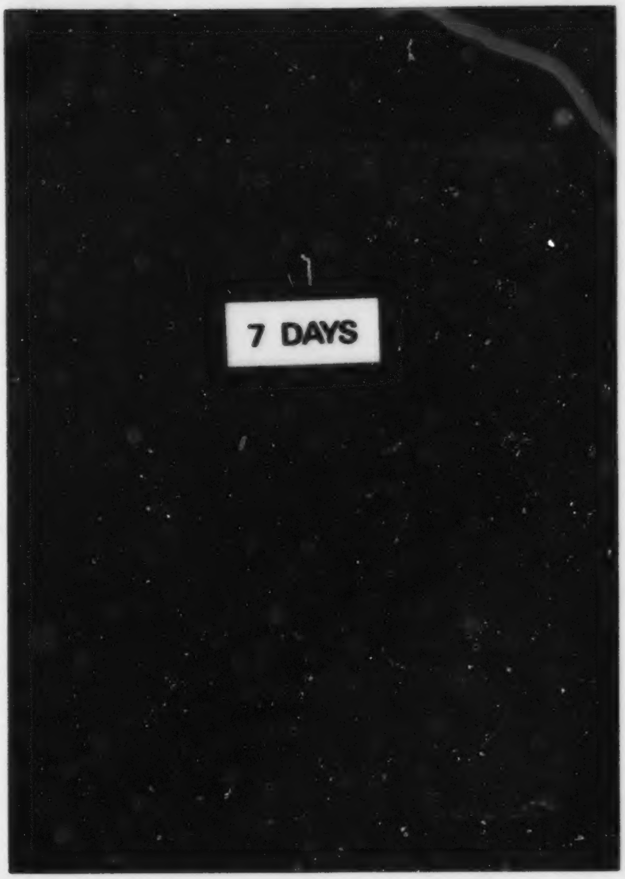
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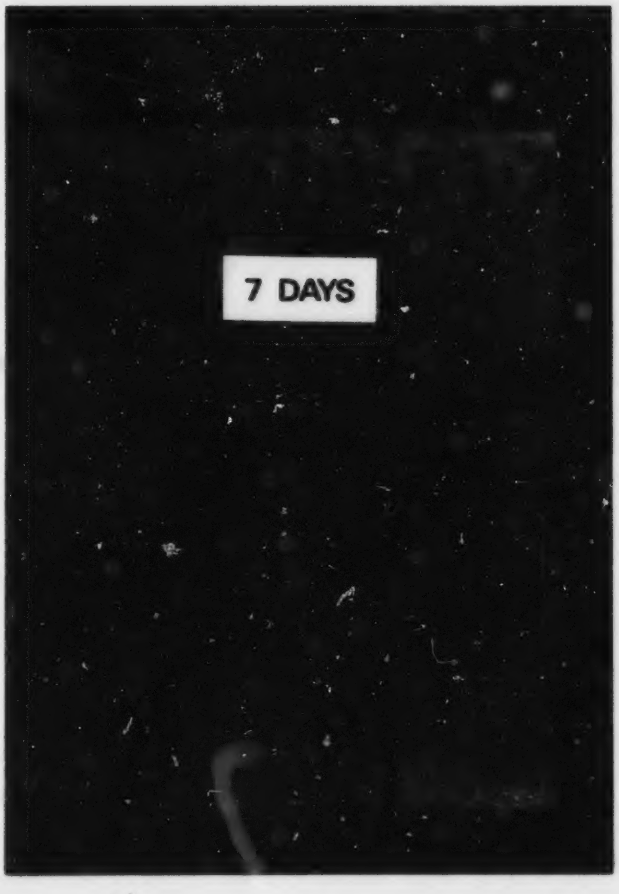
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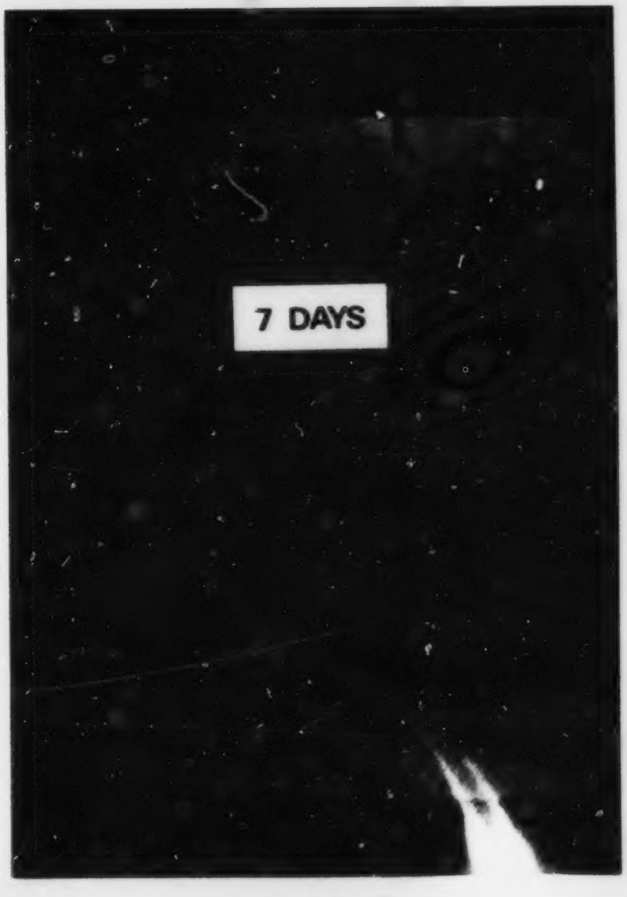
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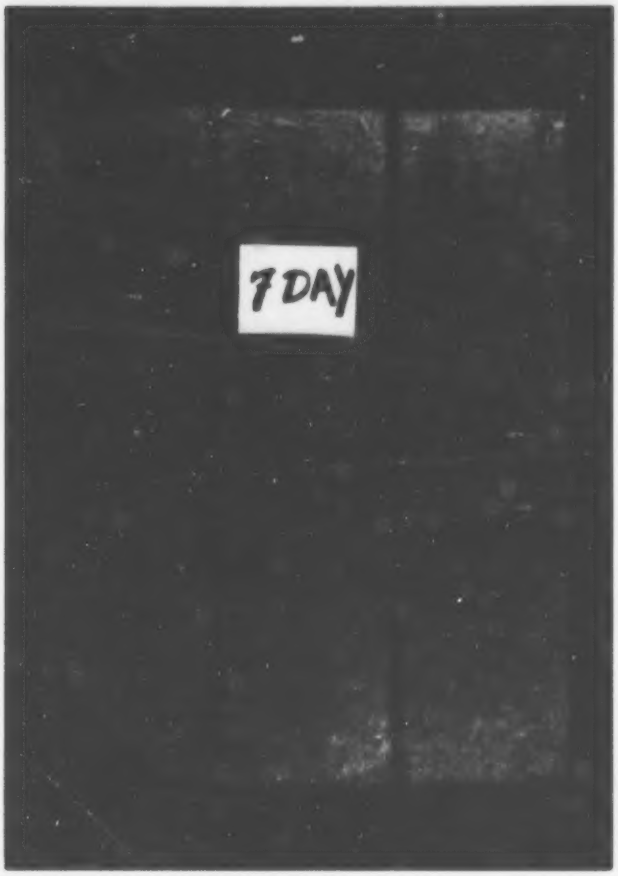
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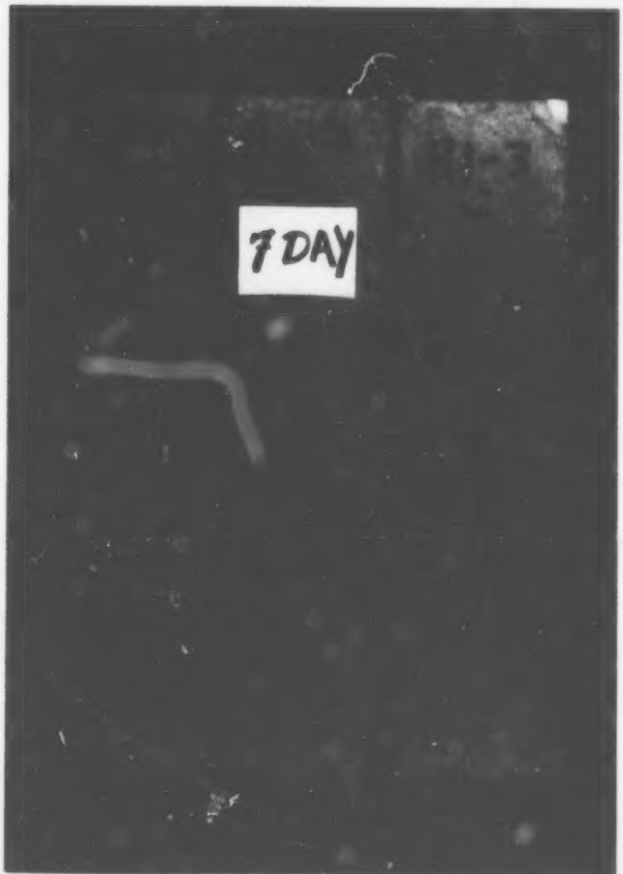
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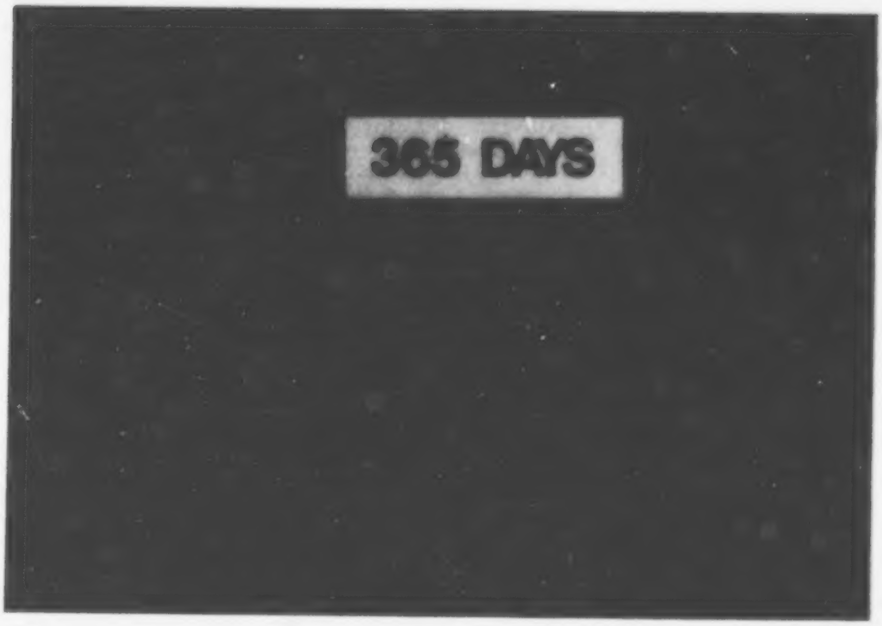
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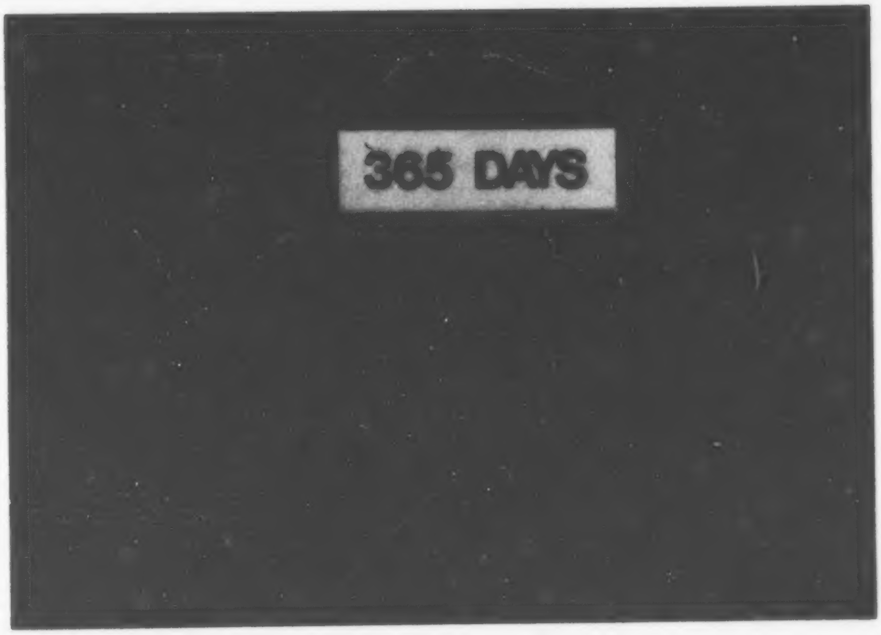
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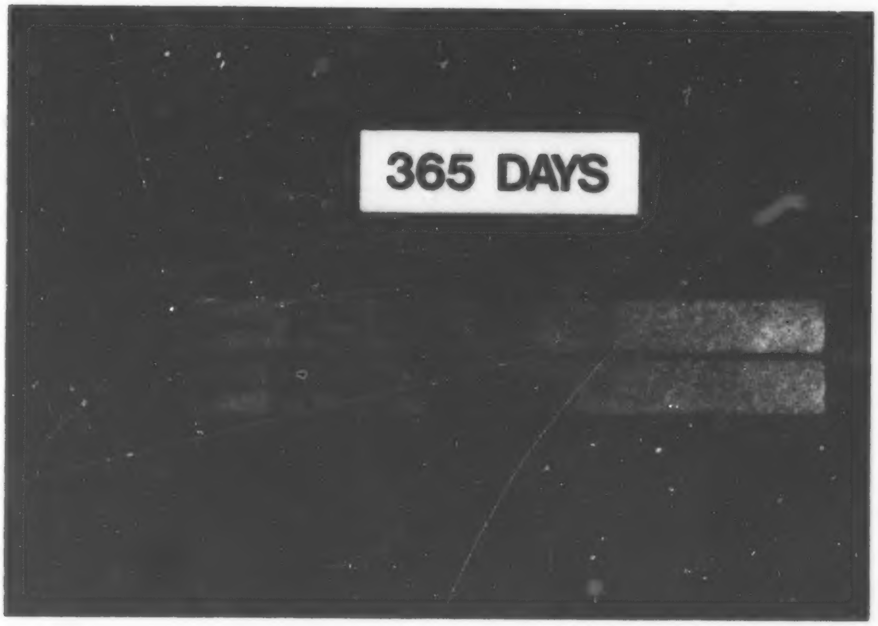
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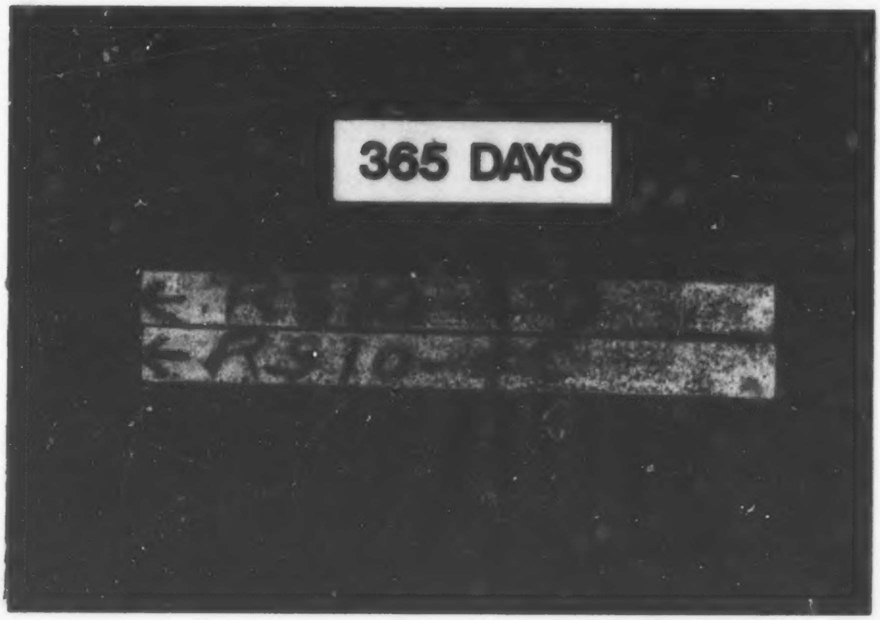
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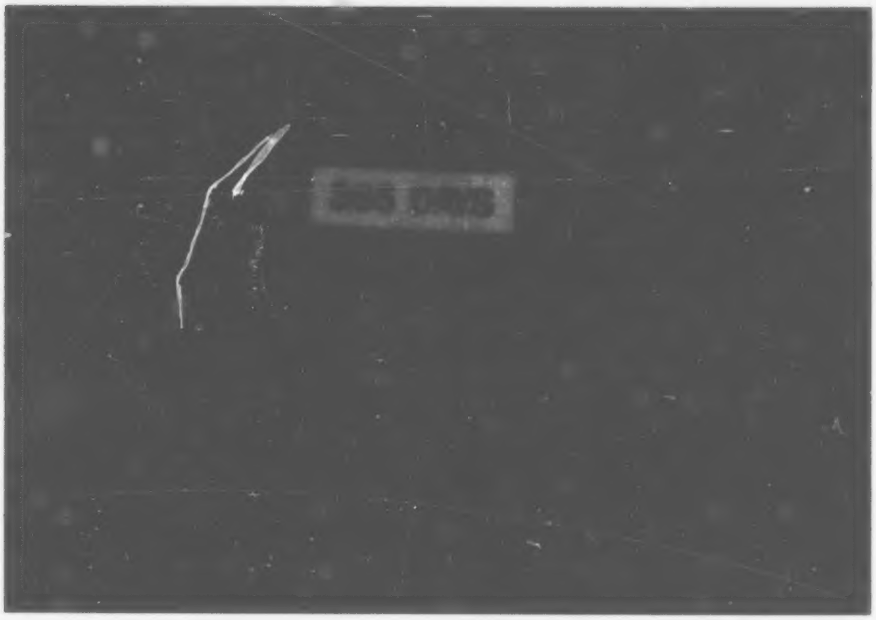

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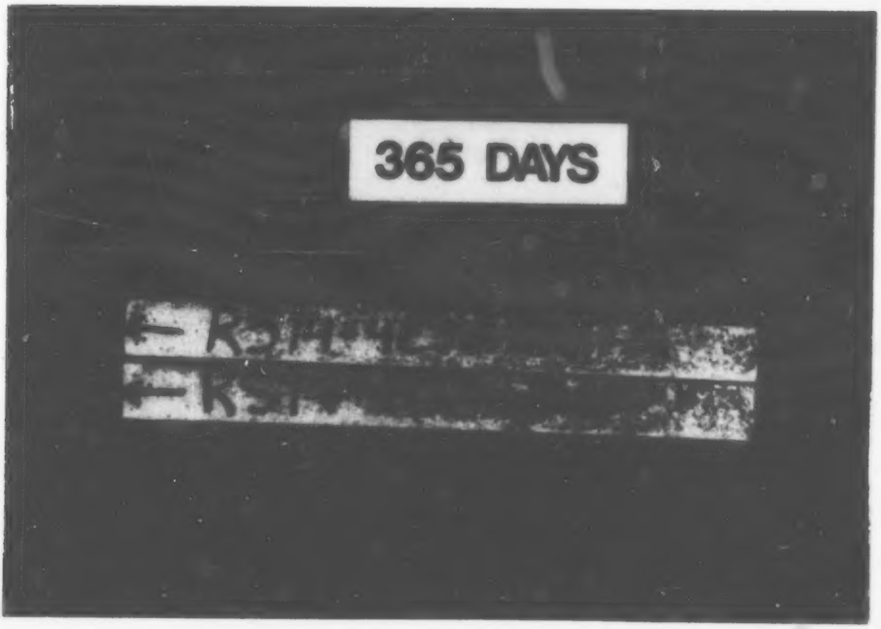
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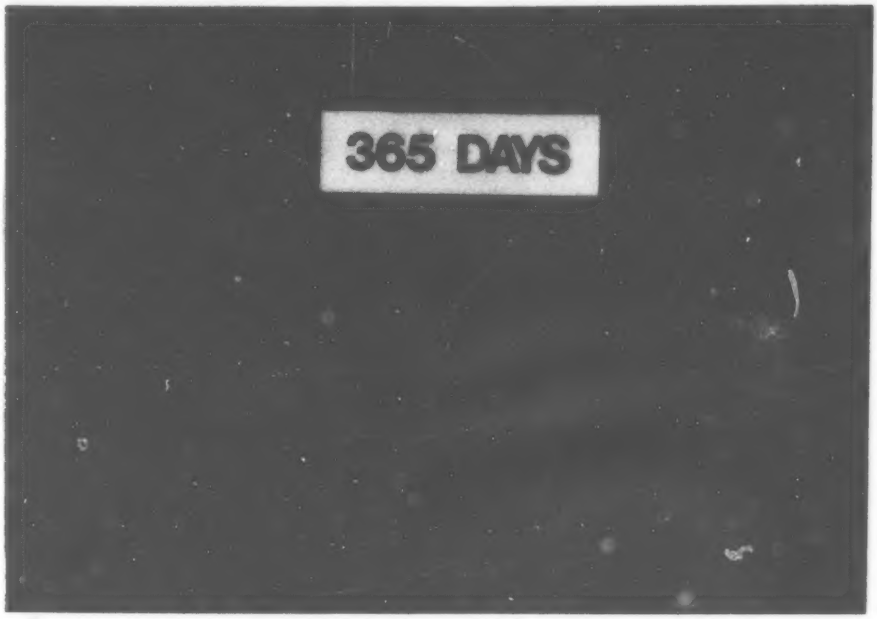
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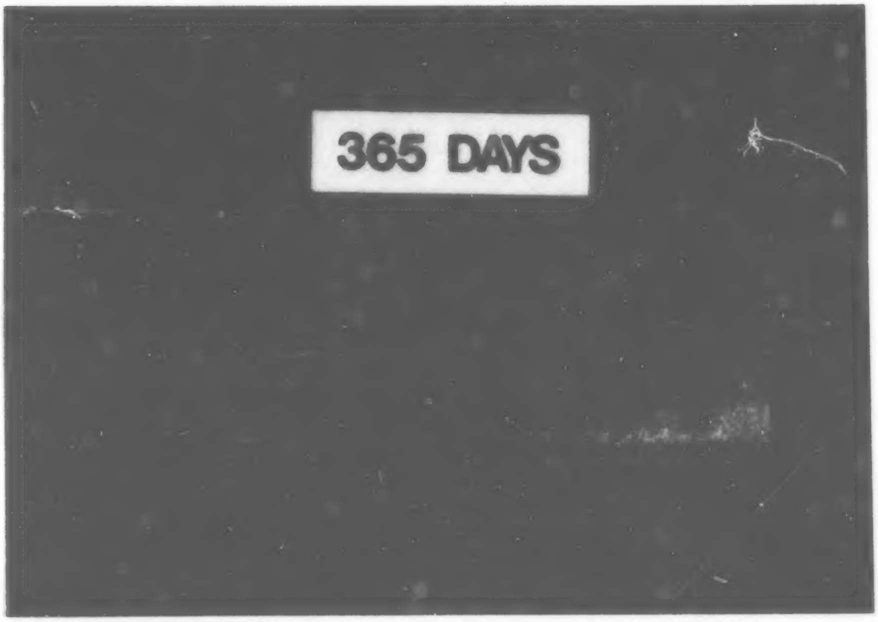
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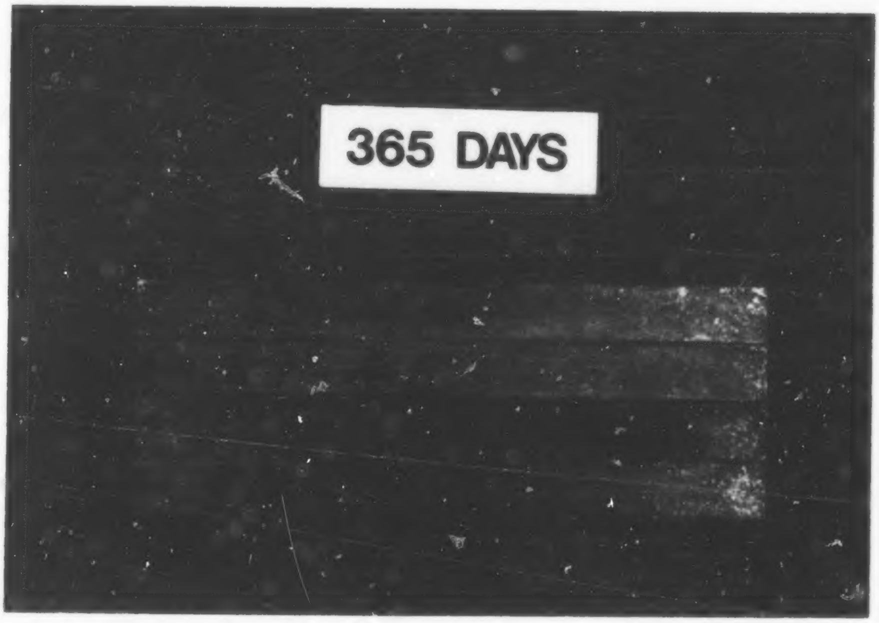
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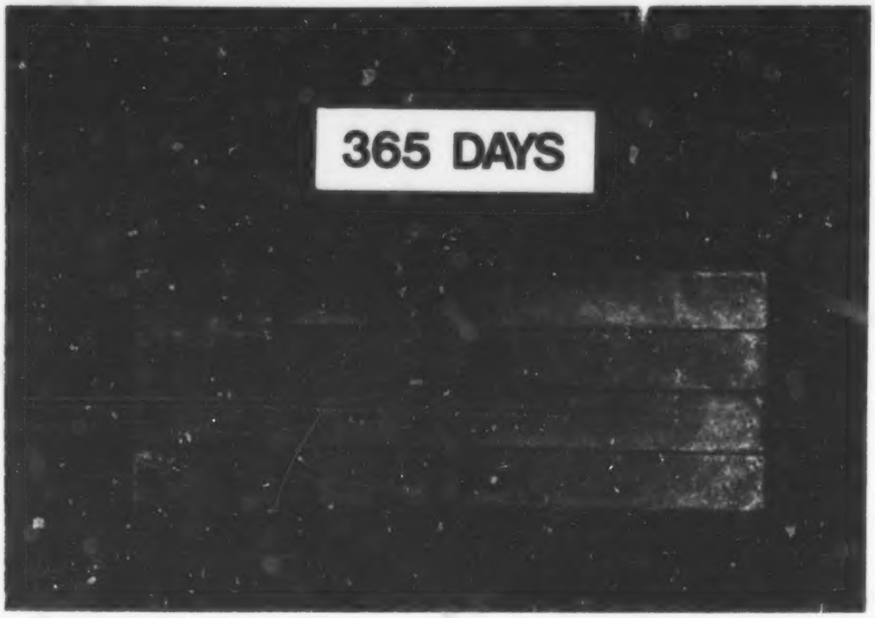
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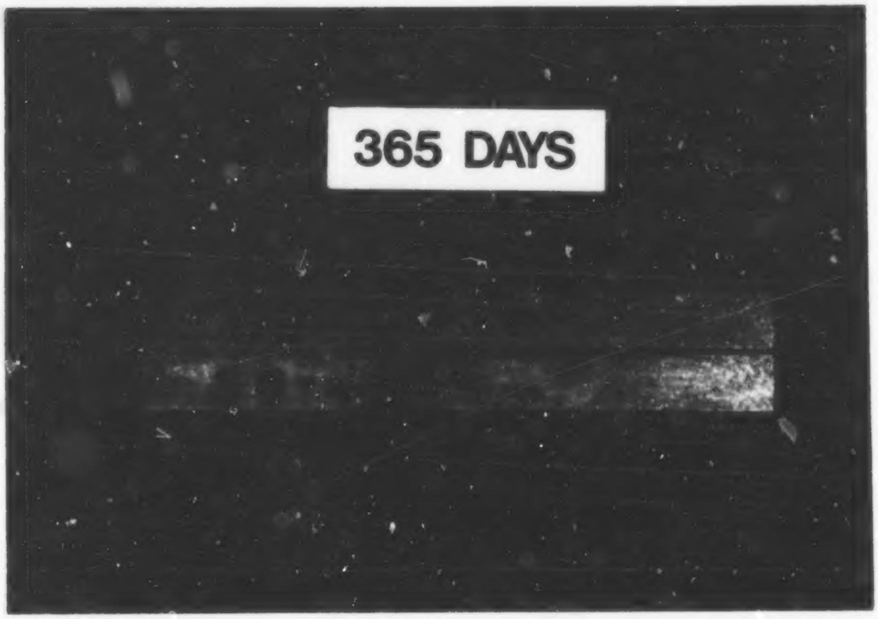
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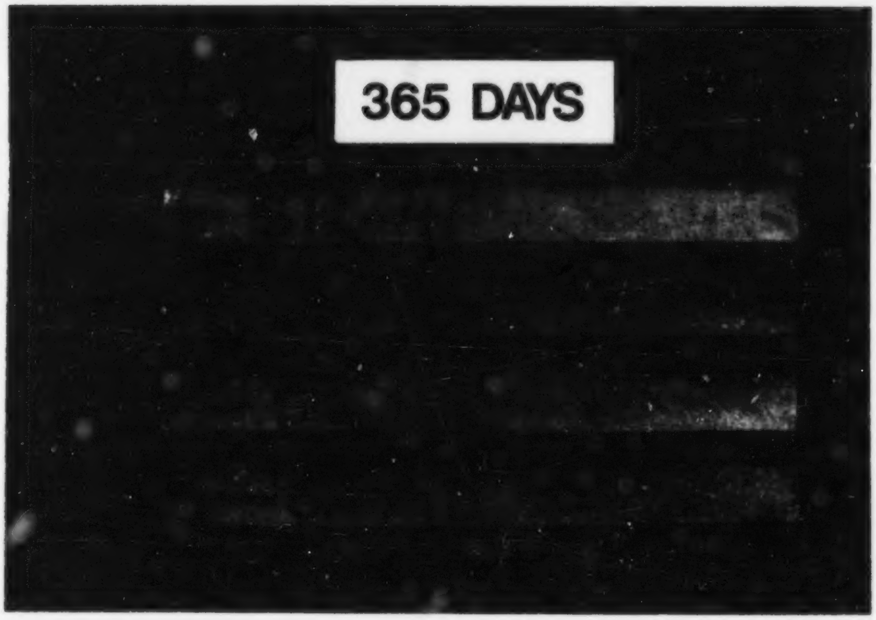
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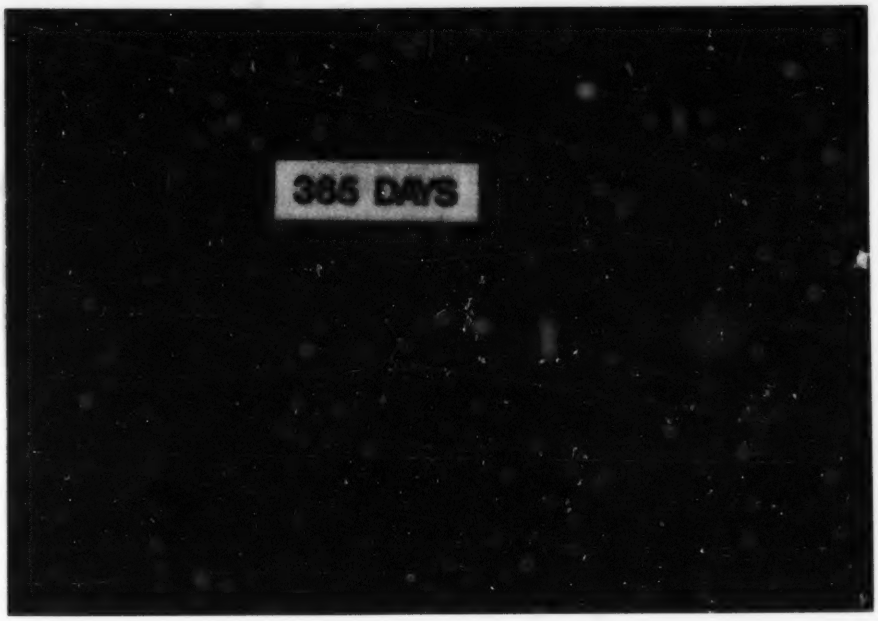
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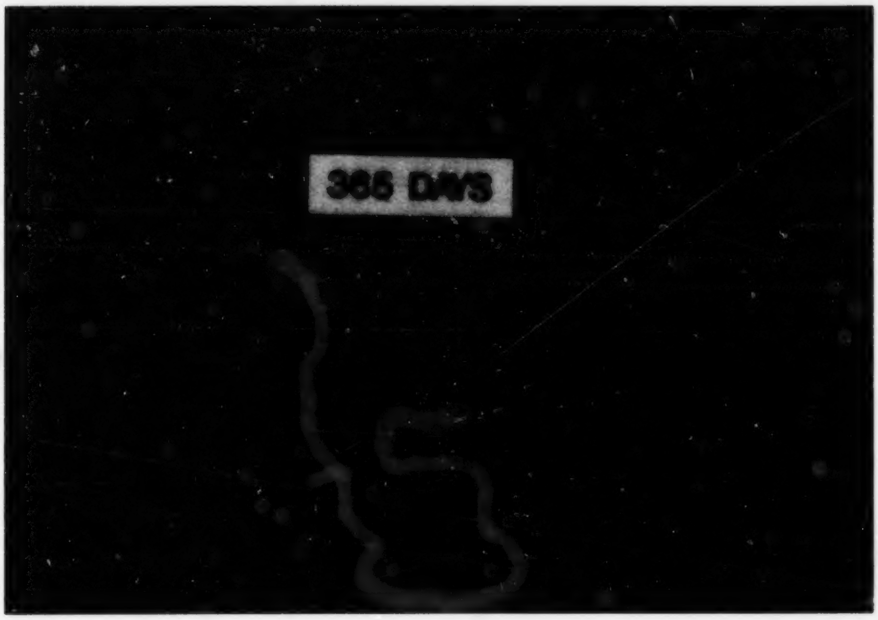
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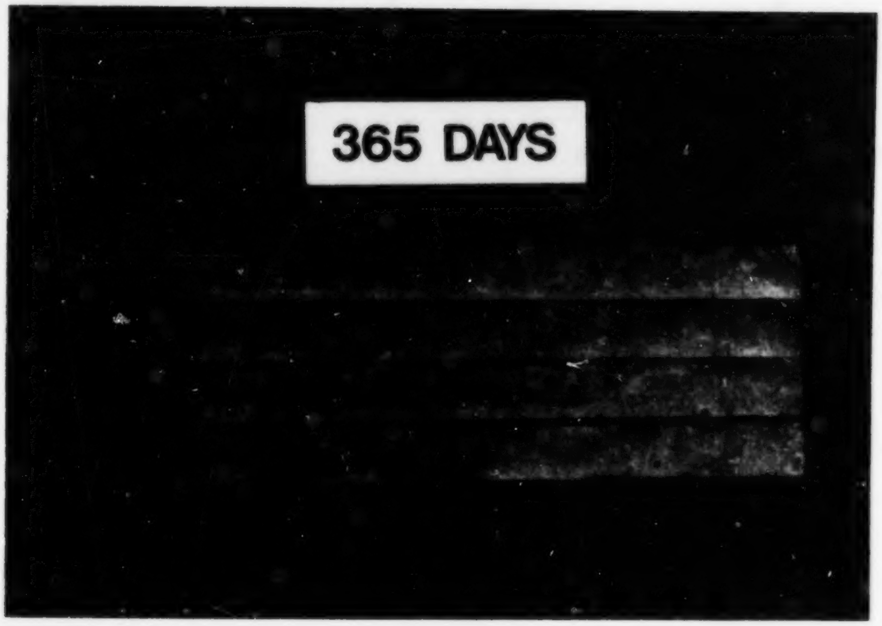
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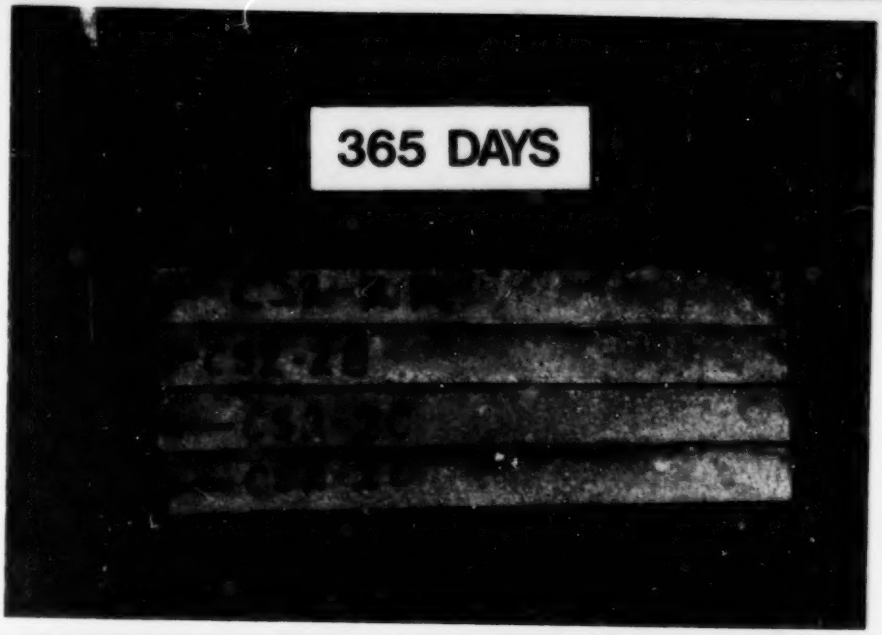
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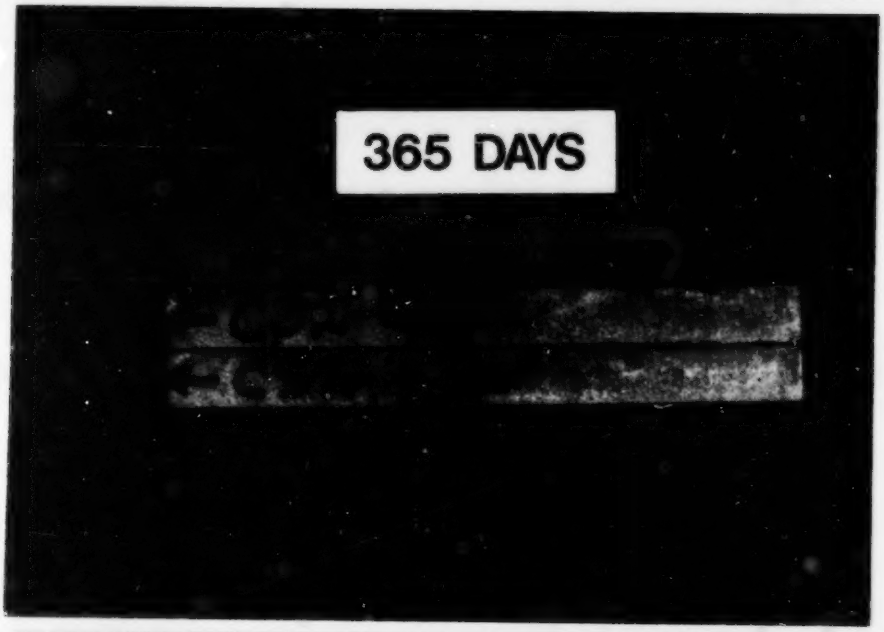
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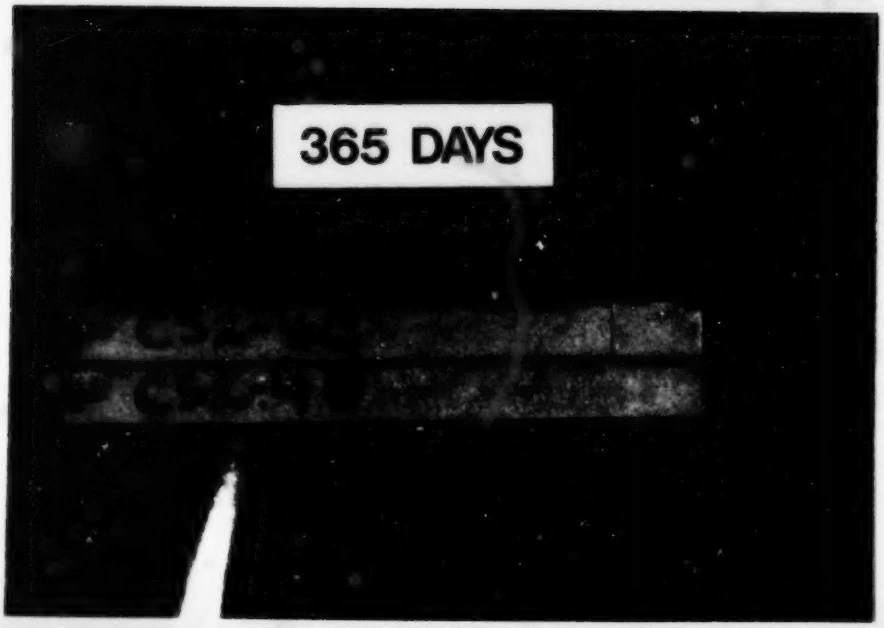
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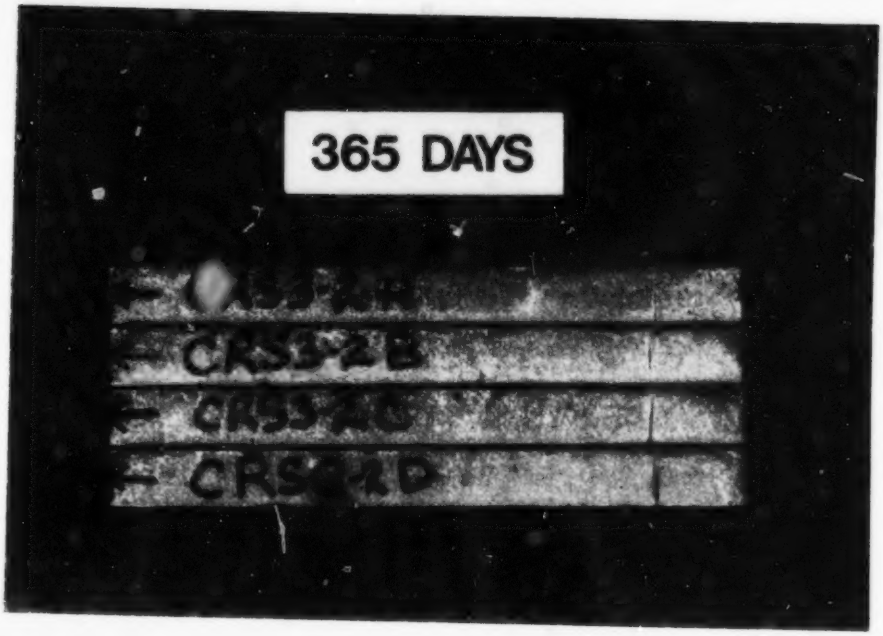
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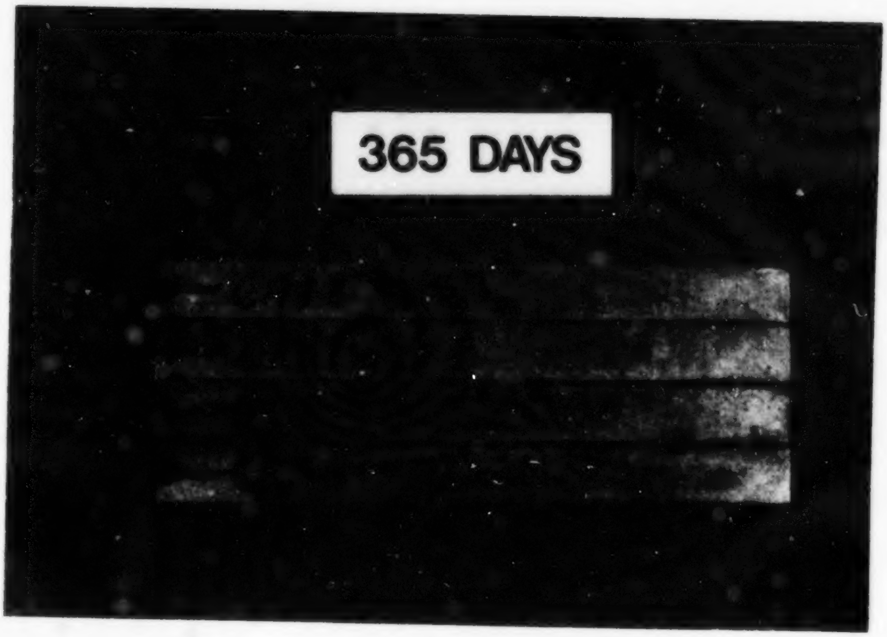
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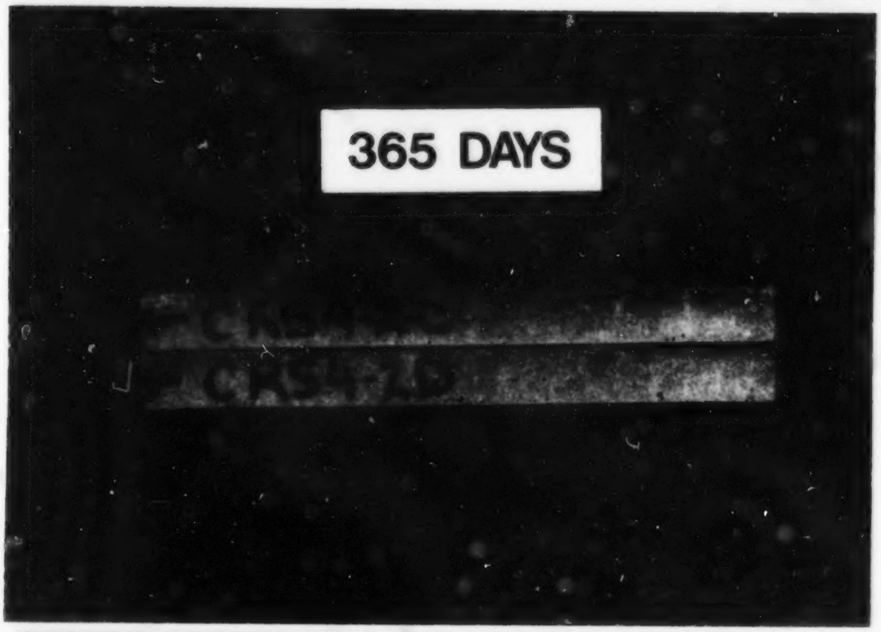
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